2017 Annual Groundwater Monitoring Report Taylor Lumber and Treating Superfund Site Sheridan, Oregon

Prepared for:
Oregon Department of Environmental Quality

May 30, 2017
1843-01/Task 3

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1.0 Introduction

This Groundwater Monitoring Report describes the results of annual groundwater monitoring activities at and in the vicinity of the Taylor Lumber and Treating (TLT) Superfund Site located at 22125 SW Rock Creek Road in Yamhill County, Sheridan, Oregon (the Site; Figure 1). This report was prepared for the Oregon Department of Environmental Quality (DEQ) under Task 3 of Task Order No. 20-13-4. The monitoring activities described in this report were conducted in general accordance with the Gro*undwater Monitoring Work Plan* submitted to DEQ on April 4, 2013 (Work Plan; Apex Companies, LLC [Apex], 2013). The Work Plan was based on the *Long-term Groundwater Monitoring and Reporting Plan – Taylor Lumber and Treating Superfund Site* prepared by the U.S. Environmental Protection Agency (EPA) in March 2010 (LGMP; EPA, 2010). The LGMP was fully incorporated into the Work Plan; therefore, there are no significant changes of note between the LGMP and the Work Plan.

1.1 Background

The Site is a wood-treating facility that was operated by TLT from 1946 until 2001, when TLT filed for bankruptcy. Pacific Wood Preserving of Oregon (PWPO) entered into a Prospective Purchaser Agreement (PPA) with the EPA and purchased the wood treatment portion of the facility. An Amendment to Agreement and Covenant Not to Sue between EPA and PWPO was finalized on May 26, 2011, and an Amended PPA between DEQ and PWPO was finalized on June 7, 2011. PWPO began operations at the Site in 2002, treating wood using copper- and borate-based solutions. Beginning June 7, 2011, PWPO began using a pentachlorophenol (PCP) solution to treat wood. In November 2013, PWPO was purchased by McFarland Cascade, A Stella Jones Company.

A Record of Decision (ROD) for the Site was signed on September 30, 2005 (EPA, 2005). The ROD identifies PCP as the contaminant of concern (COC) in Site groundwater (EPA, 2005). In accordance with the ROD, contaminated soils have been removed from the Site. However, contaminated soils and groundwater remain within the treatment plant area at the Site, enclosed by a soil-bentonite barrier wall. A low-permeability asphalt cap has been placed over the entire area enclosed by the barrier wall, which impedes the infiltration of stormwater into the groundwater located within the barrier wall. Four groundwater extraction wells have been installed within the barrier wall to stimulate an inward hydraulic gradient and prevent water from rising above the cap (EPA, 2010).

1.2 Scope of Work

The scope of work was completed in general accordance with the Work Plan (Apex, 2013). The following activities comprise the scope of work as summarized in the Work Plan:

1) For health and safety purposes, measure organic vapors in the well headspace prior to monitoring and sampling activities;

2) Observe and note well conditions in the project field notes (copies provided in Appendix A);

3) Measure water levels in Site monitoring wells and in extraction wells PW-01 through PW-04, located within the barrier wall;

4) Measure water quality parameters prior to sampling to determine water stability during purging and to qualify the representativeness of the samples;

5) Collect groundwater samples for PCP analysis from 18 monitoring wells located outside the barrier wall; and

6) Collect groundwater samples for PCP analysis from residential well RW-01.

These activities, as well as any deviations from the Work Plan, are discussed in detail within this report. A full copy of the work plan is provided in Appendix B.

2.0 Summary of Field Events

A field representative from Apex conducted the 2017 annual groundwater monitoring event at the Site from April 4 through 6, 2017. Work was conducted in general accordance with the Sampling and Analysis Plan (SAP) in Appendix B of the Work Plan (Apex, 2013). As described in Section 1.2, field activities included well headspace monitoring and documentation of well conditions, measurement of depth to water from extraction and monitoring wells, and collection of groundwater samples from monitoring wells and one residential well. Table 1 lists the groundwater monitoring wells and residential wells that were gauged and sampled as part of the Site monitoring program. The location of the monitoring wells, extraction wells, and the residential well included in the monitoring program are shown on Figure 2.

2.1 Well Inspection and Headspace Screening

Prior to sampling, well monuments were inspected for signs of damage and were noted accordingly in the field notes (Appendix A). In general, the wells were in good condition, with the exception of missing bolts on one flush monument well cover (MW-103S) and rusting locks on four wells. The well lids were opened and the headspace around each well was screened for organic vapors using a photoionization detector (PID). Headspace vapor concentration measurements were documented in the field notes provided in Appendix A. PID concentrations measured in the headspace of most of the wells were below 1 part per million (ppm; PID calibrated to 100 ppm isobutylene). PID concentrations measured in the headspace of one well (MW-16S) was above 1 ppm; before gauging this well, the field representative allowed the vapor inside the well casing to dissipate until concentrations were measured below 1 ppm. PID concentrations measured in breathing space above the wells were consistently below 1 ppm, indicating that breathing space conditions around the wells were safe for the field representative.

2.2 Groundwater Elevation Measurements

On April 4, 2017, groundwater elevations were measured in 22 wells in accordance with the Work Plan (Apex, 2013). The well lids and caps were opened a minimum of 5 minutes prior to collecting measurements so that the air pressure in each well had time to equilibrate with the ambient air pressure and the water level could stabilize. Depth to groundwater was measured with an electronic water level probe in accordance with the Work Plan SAP (Appendix B). Depth-to-water measurements and groundwater elevation data are provided in Table 2. A groundwater potentiometric map for the Site and vicinity is provided on Figure 3.

2.3 Groundwater Sampling

Groundwater samples were collected and analyzed for PCP from 18 monitoring wells and 1 residential well during the 2017 annual monitoring event, in accordance with the Work Plan (Apex, 2013). Groundwater was purged from each monitoring well prior to sampling using dedicated Teflon tubing and a peristaltic pump. Groundwater was purged from the residential well tap for 10 minutes prior to sampling. Field parameters, including temperature, pH, dissolved oxygen, oxidation-reduction potential (ORP), specific conductivity, and turbidity were collected from the groundwater monitoring wells during the purging process using a multi-parameter meter with a flow-through cell and a stand-alone turbidity meter. Groundwater field parameters from the residential well were analyzed by collecting groundwater into a plastic cup approximately every three minutes during the purge process, then the multi-parameter meter was inserted directly into the cup to measure the field parameters (groundwater was collected into a separate glass container to measure turbidity). Detailed groundwater sampling procedures are described in the Work Plan SAP (Appendix B). Field parameter measurements are documented in the field notes in Appendix A. After purging, groundwater samples were collected in accordance with the Work Plan.

2.4 Handling of Investigation-Derived Waste

Investigation-derived waste (IDW) consisted of purge water and decontamination water. IDW generated during the monitoring event was placed in covered buckets and transported to and disposed of in the drain located to the north of the stormwater treatment system (Figure 2). Disposable items, such as gloves, paper towels, etc., were disposed of as municipal waste.

2.5 Deviations from Work Plan

The following deviations from the Work Plan occurred during the annual 2017 groundwater monitoring event:

- MW-10S dewatered during purging. In accordance with Apex Standard Operating Procedure (SOP) 2.5 (Low Flow Groundwater Sampling Procedures) included in the Work Plan SAP

(Appendix B), the water sample was collected after the well recharged to 90 percent of the initial water column.

3.0 Monitoring Results

3.1 Groundwater Elevation Results

A groundwater elevation contour map is provided on Figure 3. Groundwater flow observed at the site during the April 2017 monitoring event is from the northwest to southeast (towards the South Yamhill River) and is consistent with historical documentation of groundwater flow direction (CMH2MHill, 2003; Apex, 2012). The groundwater contour map on Figure 3 depicts a depression in the groundwater flow path that coincides with the perimeter of the barrier wall. Within the barrier wall, groundwater elevations are at least 5 feet lower than the surrounding area as groundwater is being actively extracted from within the barrier wall. Within the barrier wall, the groundwater flow direction is predominantly northerly (not consistent with regional flow), which suggests that groundwater extraction from within the barrier wall has successfully produced an isolated inward gradient.

3.2 Groundwater Analysis and Results

The groundwater samples were submitted to ESC Lab Sciences (ESC) in Mt. Juliet, Tennessee for laboratory analysis of PCP by EPA Method 8270 (PCP only). ESC is certified to analyze PCP in water samples in the state of Oregon. A copy of the Oregon laboratory certification and analytical report are included in Appendix C, along with a quality assurance/quality control (QA/QC) review of the data. The results of the data quality review indicate that the data are of acceptable quality and are suitable for their intended purpose. The April 2017 groundwater analytical results, as well as historical analytical results, are presented in Table 3. PCP concentrations in the collected samples ranged from non-detect (in 15 samples) to 191 micrograms per liter (µg/L; MW-25S). Of note, during the monitoring event, both a primary sample and a field duplicate sample were collected from well MW-25S, and the reported analytical results of the primary and the duplicate samples were significantly different (191 micrograms per liter [µg/L] in the primary sample versus 49.8 µg/L in the duplicate). As discussed in the data quality review (Appendix C), comparison of these two values is performed to assess the representativeness of the sample result and to determine if there were any issues in field sample collection or laboratory analysis that may have affected the result. This comparison is referred to as the relative percent difference (RPD), and for quality assurance purposes should be no more than 30 percent difference. The RPD between the primary and duplicate samples for well MW-25S was above the 30 percent limit and the data have therefore been flagged, and the reported concentrations for that well are considered to be estimates. The cause of the difference is related to matrix interferences and associated challenges with the laboratory analysis. Analytical results from 2011 through 2017 are summarized on Figure 4.

4.0 Data Evaluation and Conclusions

Concentration trends (from February 2002 through April 2017) for PCP in groundwater from wells MW-1S, MW-11S, MW-15S, MW-16S, PZ-105, and MW-103S are provided in Appendix D. These wells were selected to evaluate long-term concentration trends in Site perimeter and off-site wells, and to confirm that PCP in groundwater has not migrated south to the South Yamhill River or to the east under Rock Creek Road. The trend plots for wells MW-15S, MW-16S, MW-103S, and PZ-105 (all located to the south of the Site) were either stable or decreasing. PCP concentrations in groundwater in wells located to the south of Highway 18B (MW-10S, MW-24S, and MW-9S) were non-detect during the April 2017 monitoring event, and the detected concentration in MW-15S (2.86 µg/L) was the lowest concentrations that has been observed in this well since monitoring began). The data confirm that migration to the south towards the South Yamhill River is not occurring.

Trend plots for wells MW-1S and MW-11S were used to confirm that PCP in groundwater was not migrating beyond the Site barrier wall and to the east under Rock Creek Road. Concentrations in MW-1S have decreased from 14 µg/L in November 2002 to consistently non-detect since April 2011. Concentrations in MW-11S have historically varied between non-detect and 0.87 µg/L in April 2011, but have consistently been non-detect since April 2012. Therefore, the data show no evidence that eastern migration is occurring.

PCP has not been detected in water well RW-01 since the well was initially sampled in 1999. The monitoring well with the relatively highest PCP concentration (MW-25S) has shown a consistently decreasing trend since its initial sampling in 2005 (55 percent lower in April 2017 relative to the peak concentration). The concentration of PCP detected in well MW-25S during the April 2017 groundwater monitoring event represented a slight increase as compared to the April 2016 concentration detected in that well (191 µg/L versus 158 µg/L). However, as discussed in Section 3.2, both a primary sample and a field duplicate sample were collected from well MW-25S during this monitoring event, and the RPD between the primary and duplicate samples was above the 30 percent limit; therefore, the reported concentrations for that well are considered to be estimated. This slightly higher concentration in MW-25S is still consistent with an overall downward trend in the well and does not indicate a change in site conditions. Further groundwater monitoring would be needed to demonstrate the expected continuance of decreasing PCP concentrations.

5.0 References

Apex Companies, LLC (Apex), 2012. *2012 Annual Groundwater Monitoring Report Taylor Lumber and Treating Superfund Site Sheridan, Oregon.* May 22, 2012.

Apex, 2013. *Groundwater Monitoring Work Plan Former Taylor Lumber Site, Sheridan, Oregon.* April 3, 2013.

CH2MHill, 2003. *Remedial Investigation Report Taylor Lumber and Treating Superfund Site Sheridan, Oregon Volume I.* October, 2003.

U.S. Environmental Protection Agency (EPA), 2005. *Final Record of Decision Taylor Lumber and Treating Superfund Site, Sheridan, Oregon.* September 30, 2005.

EPA, 2010. *Long-term Groundwater Monitoring and Reporting Plan. Taylor Lumber and Treating Superfund Site.* March, 2010.

Table 1
Groundwater Monitoring Program
Taylor Lumber and Treating

Well I.D.	Wells to be Sampled	Water Level Measurements*
Outside Barrier Wall		
MW-1S	X	X
MW-6S	X	X
MW-6D	X	X
MW-12S	X	X
MW-13S	X	X
MW-15S	X	X
MW-16S	X	X
MW-19S	X	X
MW-20S	X	X
MW-25S	X	X
MW-103S	X	X
PZ-101	X	X
PZ-102	X	X
PZ-105	X	X
South of Highway 18B		
MW-9S	X	X
MW-10S	X	X
MW-24S	X	X
East of Rock Creek Road		
MW-11S	X	X
Residences**		
RW-01	X	
Extraction Wells Inside Barrier Wall		
PW-1		X
PW-02		X
PW-03		X
PW-04		X

Notes:

1. * = Indicates wells in which water level measurements will be collected.
2. ** = Residential addresses and contact information are as follows:

RW- 01: (b)(6) - Residential property owned by (b)(6)
MW-9S: Residential property owned by (b)(6)
MW-11S: Northwest Gazebo - George Gabriel owner - 503-843-0024

Table 2
Groundwater Elevation Results
Taylor Lumber and Treating

Well Number/ (Top of Casing Elevation)	Date of Measurement	Depth to Water (feet below top of casing)	Groundwater Elevation (feet)
Outside Barrier Wall			
MW-1S (207.41)	4/4/2017	3.25	204.16
MW-6S (204.39)	4/4/2017	2.43	201.96
MW-6D (204.04)	4/4/2017	2.83	201.21
MW-12S (204.49)	4/4/2017	2.88	201.61
MW-13S (204.92)	4/4/2017	3.22	201.70
MW-15S (204.68)	4/4/2017	2.39	202.29
MW-16S (205.19)	4/4/2017	2.62	202.57
MW-19S (210.44)	4/4/2017	6.59	203.85
MW-20S (208.87)	4/4/2017	6.39	202.48
MW-25S (208.74)	4/4/2017	6.33	202.41
MW-103S (207.62)	4/4/2017	3.95	203.67
PZ-101 (208.48)	4/4/2017	3.68	204.80
PZ-102 (204.02)	4/4/2017	3.96	200.06
PZ-105 (205.94)	4/4/2017	4.01	201.93
South of Highway 18B			
MW-9S (204.04)	4/4/2017	7.50	196.54
MW-10S (203.17)	4/4/2017	10.06	193.11
MW-24S (205.49)	4/4/2017	13.49	192.00
East of Rock Creek Road			
MW-11S (207.27)	4/4/2017	2.82	204.45
Extraction Wells Inside Barrier Wall			
PW-1 (203.93)	4/4/2017	6.81	197.12
PW-02 (204.96)	4/4/2017	8.69	196.27
PW-03 (206.3)	4/4/2017	9.88	196.42
PW-04 (206.98)	4/4/2017	11.12	195.86

Table 3
Groundwater Analytical Results
Taylor Lumber and Treating

Well ID	Date of Measurement	Pentachlorophenol (µg/L)
Outside Barrier Wall		
MW-1S	5/1/1999*	--
	Feb-02	< 25
	May-02	6.9
	Aug-02	14
	Nov-02	14
	Feb-03	6.0 J
	May-03	3.3
	4/27/2011	< 0.33
	4/10/2012	< 0.41 J
	4/9/2013	< 0.31
	4/15/2014	< 0.31
	4/7/2015	< 0.31
	4/13/2016	< 0.313
	4/6/2017	< 0.313
MW-6S	May-99	< 25
	Feb-02	0.82
	May-02	0.88
	Aug-02	1.0
	Nov-02	0.88 J
	Feb-03	--
	May-03	--
	4/26/2011	< 0.33
	4/26/2011 DUP	< 0.33
	4/10/2012	< 0.41
	4/9/2013	< 0.31
	4/15/2014	< 0.31
	4/7/2015	< 0.31
	4/13/2016	< 0.313
	4/6/2017	< 0.313
MW-6D	4/26/2011	< 0.33
	4/10/2012	< 0.41
	4/10/2012 DUP	< 0.41
	4/9/2013	< 0.31
	4/9/2013 DUP	< 0.31
	4/15/2014	< 0.31
	4/15/2014 DUP	< 0.31
	4/6/2015	< 0.31
	4/6/2015 DUP	< 0.31
	4/13/2016	< 0.313
	4/13/2016 DUP	< 0.313
	4/6/2017	< 0.313

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results
Taylor Lumber and Treating

Well ID	Date of Measurement	Pentachlorophenol (µg/L)
MW-12S	May-99	--
	Feb-02	0.32
	May-02	0.30
	Aug-02	0.45
	Nov-02	0.22 J
	Feb-03	--
	May-03	--
	4/26/2011	< 0.33
	4/10/2012	< 0.41
	4/9/2013	< 0.31
	4/15/2014	< 0.31
	4/7/2015	< 0.31
	4/13/2016	< 0.313
	4/6/2017	< 0.313
MW-13S	May-99	--
	Feb-02	0.25
	May-02	0.25
	Aug-02	2.0
	Nov-02	2.6 J
	Feb-03	< 0.32
	May-03	< 0.56
	4/26/2011	< 0.33
	4/10/2012	< 0.41
	4/9/2013	< 0.31
	4/15/2014	< 0.31 J
	4/6/2015	< 0.31
	4/13/2016	< 0.313 J
	4/6/2017	< 0.313
MW-15S	May-99	--
	Feb-02	220
	May-02	220
	Aug-02	250
	Nov-02	210
	Feb-03	130
	May-03	190
	4/26/2011	12
	4/10/2012	15 J
	4/9/2013	18
	4/15/2014	13
	4/7/2015	12
	4/12/2016	4.19 J
	4/5/2017	2.86

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results
Taylor Lumber and Treating

Well ID	Date of Measurement	Pentachlorophenol (µg/L)
MW-16S	May-99	--
	Feb-02	10
	May-02	15
	Aug-02	28
	Nov-02	21 J
	Feb-03	11
	May-03	11
	4/26/2011	11
	4/26/2011 DUP	11
	4/10/2012	5.8
	4/10/2012 DUP	8.7
	4/9/2013	8.0
	4/9/2013 DUP	9.3
	4/15/2014	5.0
	4/15/2014 DUP	5.4
	4/7/2015	5.3
	4/7/2015 DUP	4.6
	4/13/2016	3.20 J
	4/13/2016 DUP	3.07 J
	4/6/2017	3.58
	4/6/2017 DUP	3.20
MW-19S	May-99	--
	Feb-02	--
	May-02	--
	Aug-02	0.067
	Nov-02	< 0.32
	Feb-03	< 0.32
	May-03	0.061
	4/27/2011	< 0.33
	4/11/2012	< 0.41
	4/10/2013	< 0.31
	4/16/2014	< 0.31
	4/8/2015	< 0.31
	4/12/2016	< 0.313 J
	4/5/2017	< 0.313
MW-20S	May-99	--
	Feb-02	--
	May-02	--
	Aug-02	0.013 J
	Nov-02	< 0.32
	Feb-03	< 0.32
	May-03	0.027 J
	4/27/2011	< 0.33
	4/11/2012	< 0.41
	4/10/2013	< 0.31
	4/16/2014	< 0.31 J
	4/8/2015	< 0.31
	4/12/2016	< 0.313
	4/5/2017	< 0.313

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results
Taylor Lumber and Treating

Well ID	Date of Measurement	Pentachlorophenol (µg/L)
MW-25S	12/19/2005	424
	12/19/2005 DUP	396
	4/27/2011	230
	4/11/2012	200
	4/10/2013	240
	4/15/2014	290
	4/7/2015	210
	4/13/2016	158
	4/6/2017	191 D
	4/6/2017 DUP	49.8 D
MW-103S	May-99	5.6
	Feb-02	6.4
	May-02	7.0
	Aug-02	12
	Nov-02	4.7 J
	Feb-03	5.0
	May-03	20
	4/27/2011	1.6
	4/11/2012	1.4
	4/10/2013	2.3
	4/16/2014	0.56 J
	4/7/2015	0.92 J
	4/12/2016	1.36 J
	4/5/2017	0.810 J
PZ-101	May-99	< 25
	Feb-02	0.14
	May-02	0.15
	Aug-02	0.14
	Nov-02	1.1 J
	Feb-03	--
	May-03	0.067
	4/27/2011	< 0.33
	4/11/2012	< 0.41
	4/10/2013	< 0.31 J
	4/16/2014	< 0.31
	4/8/2015	< 0.31
	4/12/2016	< 0.313
	4/5/2017	< 0.313

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results
Taylor Lumber and Treating

Well ID	Date of Measurement	Pentachlorophenol (µg/L)
PZ-102	May-99	< 25
	Feb-02	0.37
	May-02	0.30
	Aug-02	0.34
	Nov-02	0.13 J
	Feb-03	0.23 J
	May-03	< 0.32
	4/27/2011	< 0.33
	4/10/2012	< 0.41
	4/9/2013	< 0.31
	4/15/2014	< 0.31
	4/8/2015	< 0.31
	4/13/2016	< 0.313
	4/5/2017	< 0.313
PZ-105	May-99	82 J
	Feb-02	3.5
	May-02	8.2
	Aug-02	17
	Nov-02	4.0 J
	Feb-03	0.77
	May-03	2.6
	4/26/2011	< 0.33
	4/10/2012	< 0.41
	4/9/2013	1.6
	4/16/2014	< 0.31
	4/8/2015	< 0.31
	4/12/2016	< 0.313
	4/4/2017	< 0.313
South of Highway 18B		
MW-9S	May-99	< 24
	Feb-02	< 0.047
	May-02	< 0.049
	Aug-02	< 0.023
	Nov-02	< 0.32
	Feb-03	< 0.32
	May-03	< 0.046
	4/26/2011	< 0.33
	4/11/2012	< 0.41
	4/10/2013	< 0.31
	4/16/2014	< 0.31
	4/8/2015	< 0.31
	4/14/2016	< 0.313
	4/4/2017	< 0.313

Please refer to notes at end of table.

Table 3
Groundwater Analytical Results
Taylor Lumber and Treating

Well ID	Date of Measurement	Pentachlorophenol (µg/L)
MW-10S	May-99	< 26
	Feb-02	0.099
	May-02	0.13
	Aug-02	0.38
	Nov-02	0.18 J
	Feb-03	< 0.32
	May-03	0.13
	4/27/2011	< 0.33
	4/11/2012	< 0.41
	4/10/2013	< 0.31
	4/16/2014	< 0.31
	4/8/2015	< 0.31
	4/14/2016	< 0.313
	4/5/2017	< 0.313
MW-24S	4/27/2011	< 0.33
	4/11/2012	< 0.41 J
	4/10/2013	< 0.31 J
	4/16/2014	< 0.31
	4/8/2015	< 0.31
	4/14/2016	< 0.313
	4/5/2017	< 0.313
East of Rock Creek Road		
MW-11S	May-99	< 25
	Feb-02	0.18
	May-02	0.18
	Aug-02	0.36
	Nov-02	< 0.32
	Feb-03	< 0.32
	May-03	0.18
	4/27/2011	0.87 J
	4/11/2012	< 0.41
	4/10/2013	< 0.31 J
	4/15/2014	< 0.31
	4/7/2015	< 0.31
	4/13/2016	< 0.313
	4/6/2017	< 0.313

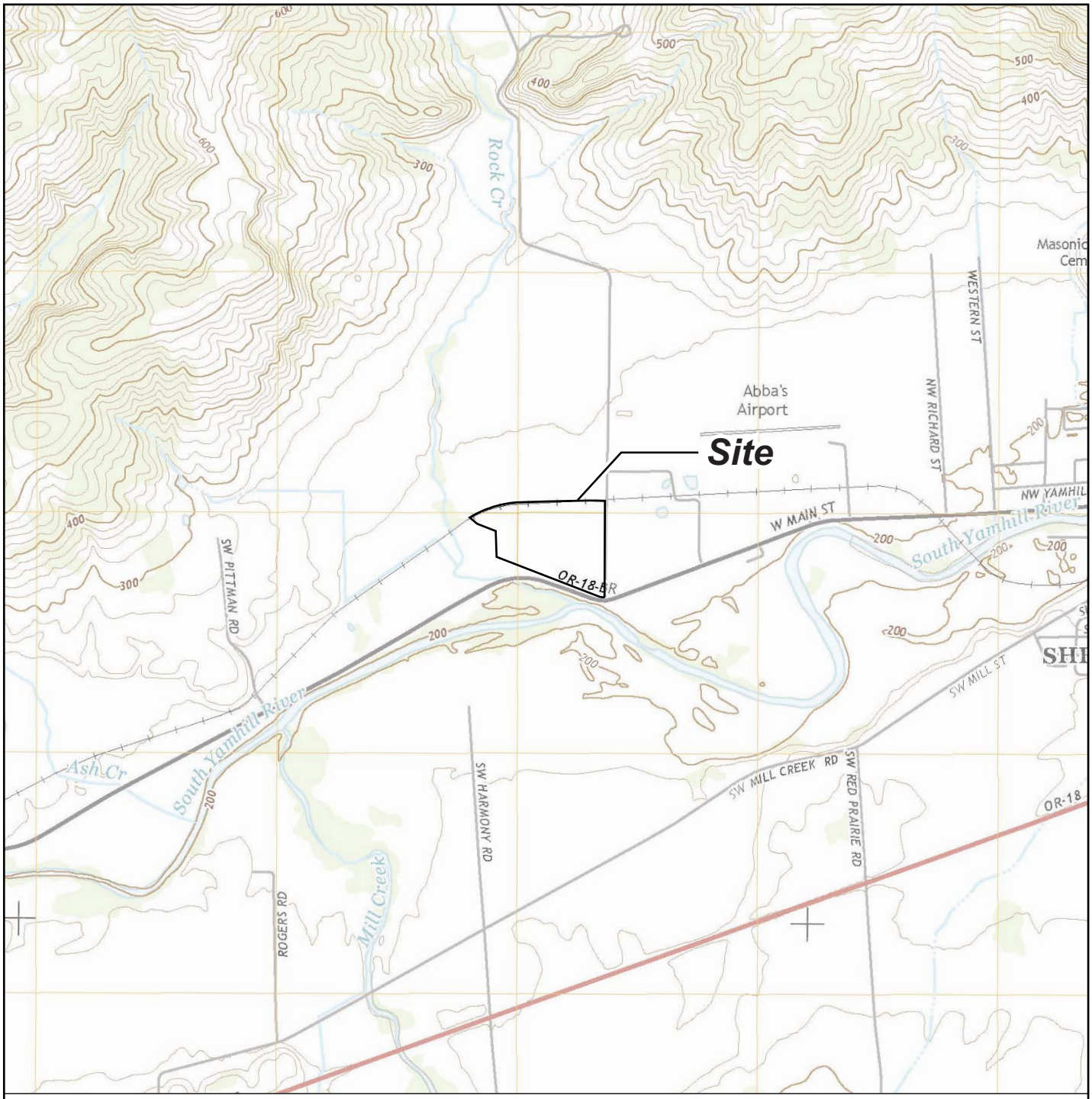
Please refer to notes at end of table.

Table 3
Groundwater Analytical Results
Taylor Lumber and Treating

Well ID	Date of Measurement	Pentachlorophenol (µg/L)
Residences		
RW-01	May-99	< 25
	Feb-02	< 0.045
	May-02	< 0.049
	Aug-02	< 0.046
	Nov-02	< 0.32
	Feb-03	< 0.045
	May-03	< 0.046
	4/27/2011	< 0.33
	4/11/2012	< 0.41
	4/10/2013	< 0.31
	4/16/2014	< 0.31
	4/8/2015	< 0.31
	4/13/2016	< 0.313
	4/4/2017	< 0.313

Notes:

1. Sample dates for historical (pre-2005) data are not available; results available in month/year format only.
2. J = Reported value is considered estimated based on data quality review.
3. D = The relative percent difference (RPD) between the field sample and the field duplicate exceeds the control limit of 30%
4. -- = Not Sampled
5. BOLD indicates analyte detected above method reporting limit.
6. DUP = Duplicate sample.



Note: Base map prepared from USGS 7.5-minute quadrangle of Sheridan, OR, 2014 as provided by USGS.gov.

0 2,000 4,000

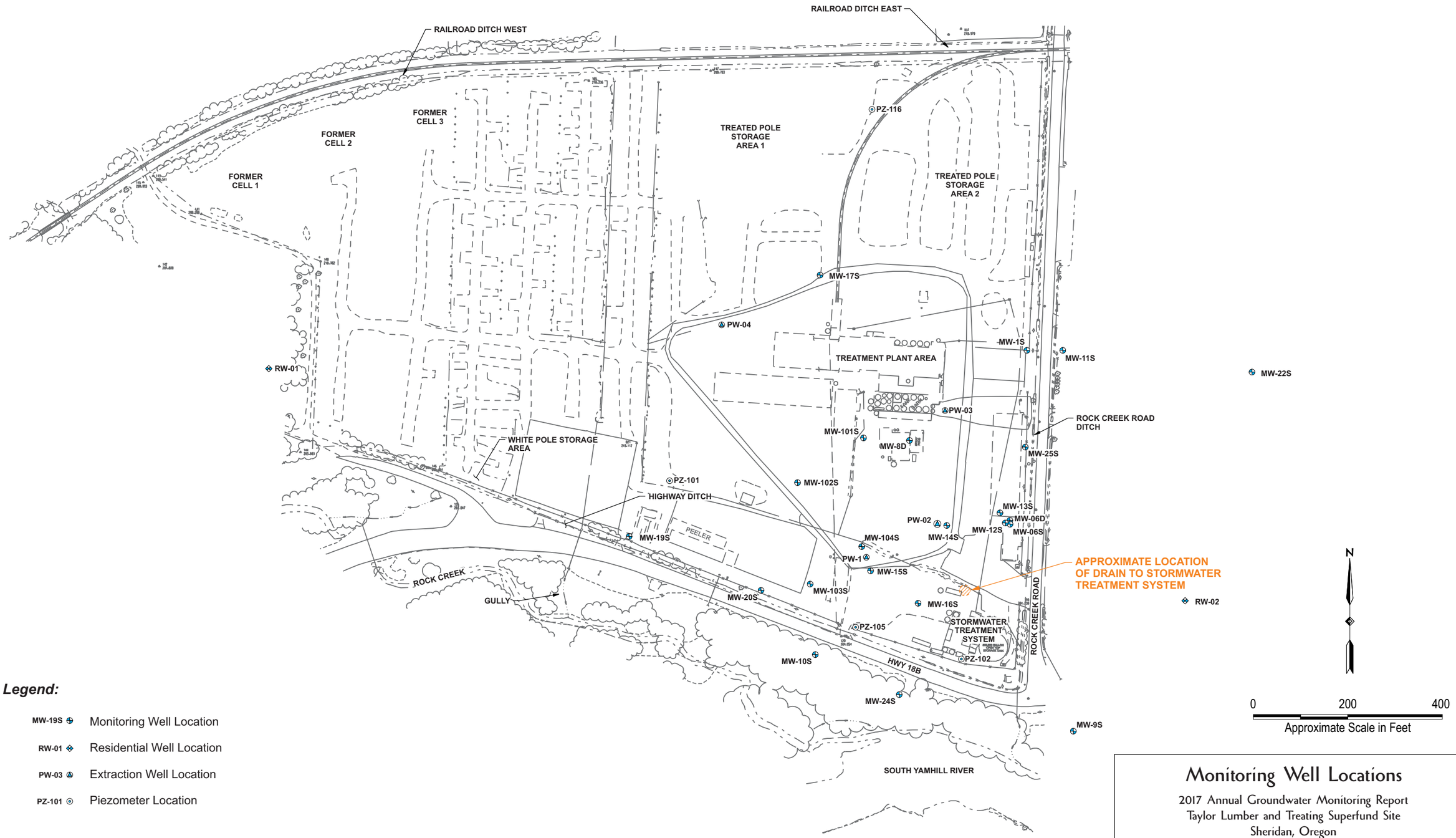
Approximate Scale in Feet

N

Site Location Map

2017 Annual Groundwater Monitoring Report
Taylor Lumber and Treating Superfund Site
Sheridan, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1843-01	Figure
	May 2017		1



Legend:

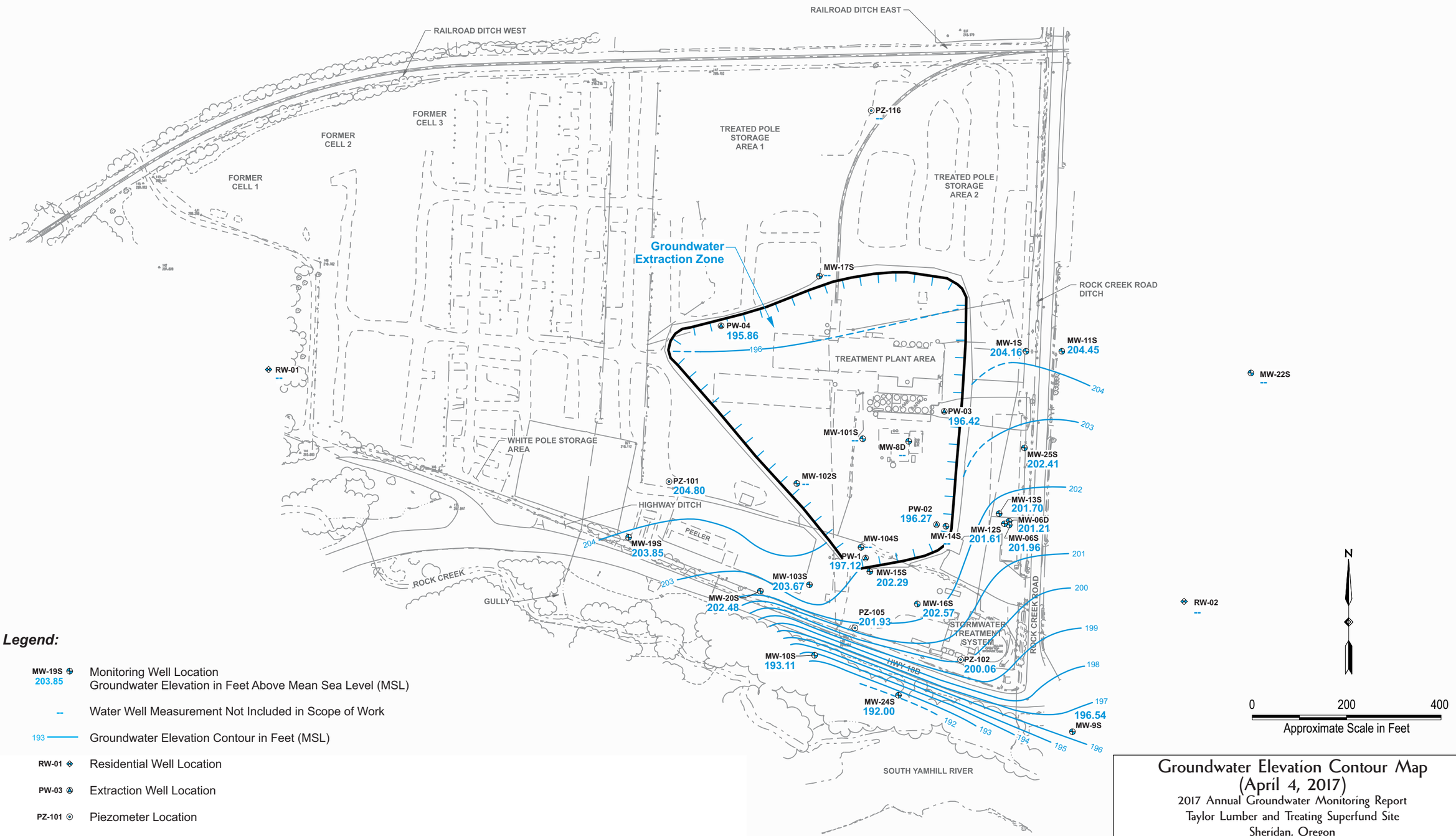
MW-19S	Monitoring Well Location
RW-01	Residential Well Location
PW-03	Extraction Well Location
PZ-101	Piezometer Location

NOTE: Base map prepared from a CH2MHILL Monitor Well Plan (6/11/2009).

Monitoring Well Locations

2017 Annual Groundwater Monitoring Report
Taylor Lumber and Treating Superfund Site
Sheridan, Oregon

APEX	Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number 1843-01 May 2017	Figure 2



Legend:

MW-19S 203.85	Monitoring Well Location Groundwater Elevation in Feet Above Mean Sea Level (MSL)
--	Water Well Measurement Not Included in Scope of Work
193	Groundwater Elevation Contour in Feet (MSL)
RW-01	Residential Well Location
PW-03	Extraction Well Location
PZ-101	Piezometer Location
	Barrier Wall

NOTE: Base map prepared from a CH2MHILL Monitor Well Plan (6/11/2009).

Groundwater Elevation Contour Map (April 4, 2017)

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APEX

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1843-01	Figure
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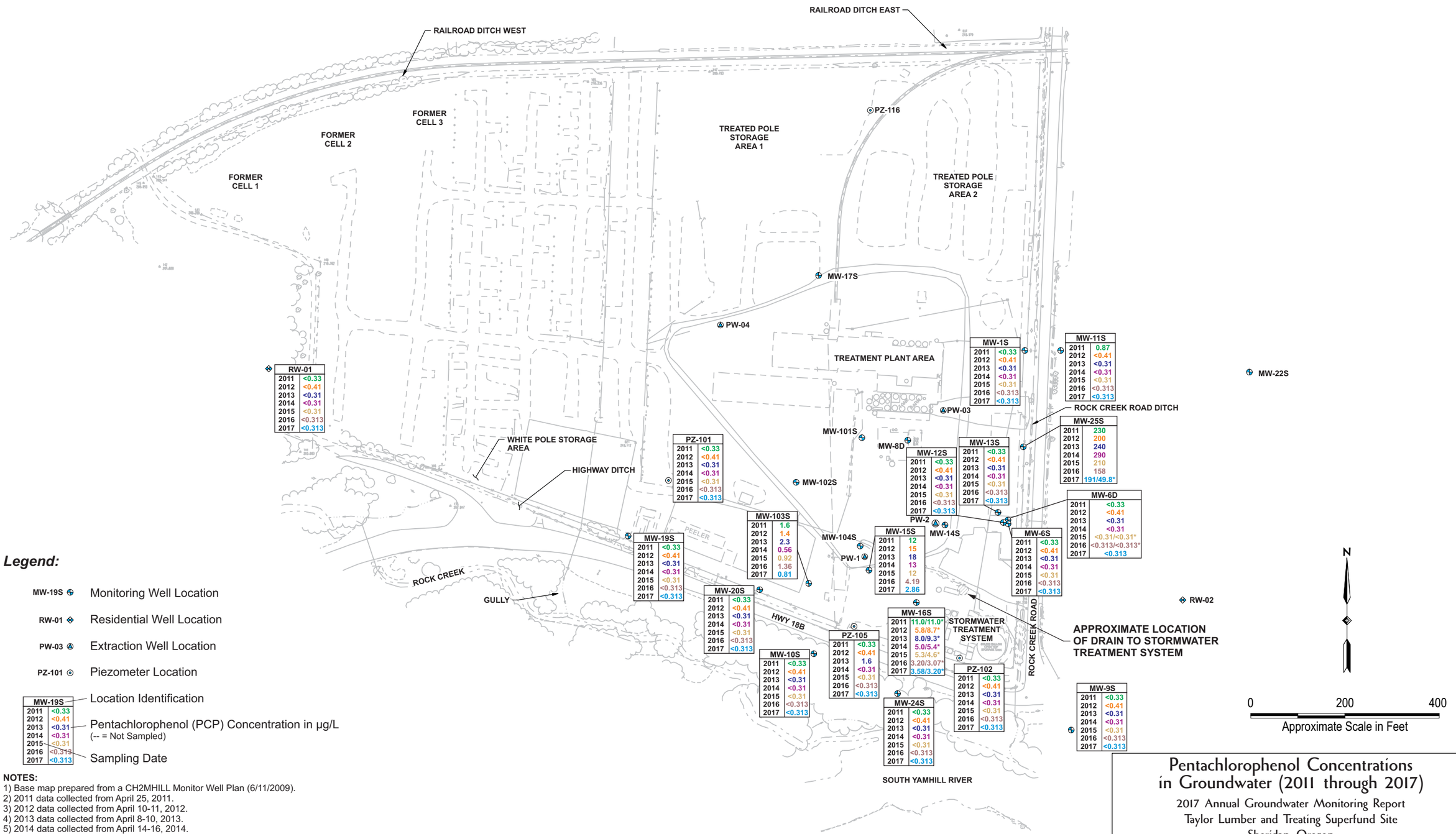

RW-01	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-1S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-11S	
2011	0.87
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-25S	
2011	230
2012	200
2013	240
2014	290
2015	210
2016	158
2017	191/49.8*

PZ-101	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-12S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-13S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-6D	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31/<0.31*
2016	<0.313/<0.313*
2017	<0.313

MW-6S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-103S	
2011	1.6
2012	1.4
2013	2.3
2014	0.56
2015	0.92
2016	1.36
2017	0.81

MW-15S	
2011	12
2012	15
2013	18
2014	13
2015	12
2016	4.19
2017	2.86

MW-19S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-20S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-16S	
2011	11.0/11.0*
2012	5.8/8.7*
2013	8.0/9.3*
2014	5.0/5.4*
2015	5.3/4.6*
2016	3.20/3.07*
2017	3.58/3.20*

PZ-105	
2011	<0.33
2012	<0.41
2013	1.6
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-10S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

PZ-102	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-24S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

MW-9S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

Legend:

MW-19S — Monitoring Well Location

RW-01 — Residential Well Location

PW-03 — Extraction Well Location

PZ-101 — Piezometer Location

MW-19S — Location Identification

MW-19S	
2011	<0.33
2012	<0.41
2013	<0.31
2014	<0.31
2015	<0.31
2016	<0.313
2017	<0.313

Pentachlorophenol (PCP) Concentration in µg/L
(-- = Not Sampled)

Sampling Date

NOTES:
1) Base map prepared from a CH2MHILL Monitor Well Plan (6/11/2009).
2) 2011 data collected from April 25, 2011.
3) 2012 data collected from April 10-11, 2012.
4) 2013 data collected from April 8-10, 2013.
5) 2014 data collected from April 14-16, 2014.
6) 2015 data collected from April 6-8, 2015.
7) 2016 data collected from April 12-14, 2016.
7) 2017 data collected from April 4-6, 2017.
9) Residential well (RW-02) is damaged and not in use, therefore, water was not sampled from this well.
10) * = Duplicate sample collected from monitoring wells. Results are presented as "sample/duplicate".

Pentachlorophenol Concentrations in Groundwater (2011 through 2017)

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Sheridan, Oregon

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1843-01	Figure
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Appendix A

Field Notes and Well Sampling Sheets

WELL GAGING DATA SHEET

APEX

		Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/4/17
Project:	Former Taylor Lumber Site	Sampler:	KK, MW
Weather:	Overcast 47°,	Time In/Out:	

WATER LEVEL DATA 2-4 E to SE

Well I.D.	Time	Headspace PID (ppm)	Depth to Water (feet)	Depth to Well Bottom (feet)	Water Column Height (feet)	Purge Volume *(Water Column Height x Multiplier)*	Notes/Other Remarks
Water Height Multipliers (gal)		1-inch = 0.041		2-inch = 0.162		4-inch = 0.653	1 gallon = 3.785 liters
MW-1S	1119	0.6	3.25	15.0	11.75		
MW-6S	1102	0.3	2.43	11.9	9.47		
MW-6D	1104	0.3	2.83	29.2	26.37		
MW-9S	1150	0.8	7.50	14.3	6.8		
MW-10S	0956	0.0	10.06	11.5	1.44		RUSTED LOCK
MW-11S	1137	0.0	2.82	19.5	16.68		
MW-12S	1058	0.2	2.88	12.0	9.12		
MW-13S	1107	0.7	3.22	14.0	10.78		
MW-15S	1037	0.5	2.39	12.5	10.11		
MW-16S	1048	3.0	2.62	13.5	10.88		PID MEASURED IN WELL
MW-19S	1025	0.0	6.59	15.5	8.91		
MW-20S	1022	0.6	6.39	14.5	8.11		Rusted Lock
MW-24S	1006	0.0	13.49	17.2	3.71		Rusted Lock
MW-25S	1113	0.1	6.33	19.3	12.97		
MW-103S	1014	1.6	3.95	16.0	12.05		WATER IN MON. 0/3 BOLTS
PZ-101	1031	0.7	3.68	13.5	9.82		
PZ-102	1052	0.0	3.96	12.2	8.24		Lock unlocked
PZ-105	0953	0.3	4.01	12.0	7.99		RUSTED LOCK
PW-1	1208	--	6.81	--	--		
PW-02	1212	--	8.69	--	--		
PW-03	1218	--	9.88	--	--		
PW-04	1223	--	11.12	--	--		

WELL MONITORING DATA SHEET

APEX

Well I.D.	RW-01	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4-4-2017
Project:	Former Taylor Lumber Site	Sampler:	MW/KK
Weather:	OVERCAST 52°F 2 ENE	Time In/Out:	1315/

WELL DATA

Well Depth:	--	Well Diameter:	--	Water Height	
Depth to Water:	--	Screened Interval:	--	x Multiplier	
Water Column Length:	--	Depth to Free Product:		x Casing Volumes	
Purge Volume:		Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	NA ~~Peristaltic Pump~~ MW	Pump Intake Depth:	DOMESTIC WELL	Comments	
Sampling Method:	NA ~~Peristaltic Pump~~ MW	Tubing Type:	NA ~~0.25-inch Teflon~~ MW	DOMESTIC WELL	

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1342				--							Start Purging
1352	--	--	--	--	6.55	11.11	296	--	--	--	C
1355	--	--	--	--	6.47	10.80	163	--	--	--	C
1358	--	--	--	--	6.50	10.77	151	--	--	--	C
1401	--	--	--	--	6.56	10.84	148	--	--	--	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	RW-01	Sampling Flow Rate	--	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1405	Final Depth to Water:	--	Did Well Dewater?	N	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	--	--
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

PURGE FOR 10 MINUTES THEN COLLECT PARAMETERS EVERY 3 MINUTES UNTIL EQUILIBRATED.

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-9S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/4/17
Project:	Former Taylor Lumber Site	Sampler:	KK, MW
Weather:	Overcast 55° 7 SE	Time In/Out:	

WELL DATA

Well Depth:	14.3	Well Diameter:	2"	Water Height	6.8
Depth to Water:	7.50	Screened Interval:		x Multiplier	0.162
Water Column Length:	6.8	Depth to Free Product:		x Casing Volumes	1
Purge Volume:	9.90 gallons	Free Product Thickness:		= Purge Volume	1.10 gal
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	—

PURGING DATA

Purge Method:	Peristaltic Pump				Pump Intake Depth:		SCREEN			Comments	
Sampling Method:	Peristaltic Pump				Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond. (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1432				0.13							Start Purging
1441	1.10	1.10	8.05	0.13	6.64	10.43	69	6.95	107.6	25.9	C
1450	1.10	2.20	8.25	0.13	6.68	10.53	72	5.60	105.5	21.9	C
1459	1.10	3.30	8.35	0.13	6.69	10.60	74	5.09	105.0	14.1	C
1508	1.10	4.40	8.43	0.13	6.71	10.51	78	4.75	105.6	10.6	C
1517	1.10	5.50	8.47	0.13	6.74	10.53	84	4.14	106.2	5.56	C
1526	1.10	6.60	8.51	0.13	6.77	10.51	90	3.67	106.3	4.92	C
1535	1.10	7.70	8.54	0.13	6.79	10.52	92	3.30	106.3	3.67	C
1544	1.10	8.80	8.52	0.13	6.81	10.54	99	3.00	106.1	2.79	C
1553	1.10	9.90	8.51	0.13	6.84	10.57	101	2.73	105.8	1.87	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-9S	Sampling Flow Rate	0.13 gal.	Analytical Laboratory:	ESC Lab Sciences
Sample Time:	1557	Final Depth to Water:	8.20	Did Well Dewater?	NO

# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	PZ-105	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/4/17
Project:	Former Taylor Lumber Site	Sampler:	KK
Weather:	Overcast 55° 4 ESE	Time In/Out:	

WELL DATA

Well Depth:	12.0	Well Diameter:	2"	Water Height	7.99
Depth to Water:	4.01	Screened Interval:		x Multiplier	0.162
Water Column Length:	7.99	Depth to Free Product:		x Casing Volumes	1
Purge Volume:	3.87 gallons	Free Product Thickness:		= Purge Volume	1.29
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump	Pump Intake Depth:	screen	Comments	
Sampling Method:	Peristaltic Pump	Tubing Type:	0.25-inch Teflon	—	

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1621				0.13							Start Purging
1631	1.29	1.29	8.35	0.13	6.76	11.24	84	1.13	111.5	13.6	C
1641	1.29	2.58	8.98	0.13	6.74	11.38	86	0.93	111.6	9.59	C
1651	1.29	3.87	9.19	0.13	6.76	11.42	85	0.72	108.4	6.43	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	PZ-105	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences
Sample Time:	1654	Final Depth to Water:	8.49	Did Well Dewater?	NO

# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX	Well I.D.	MW-10S	Job Number: 320001843-01.003
	Client:	Oregon DEQ	Date: 4/5/17
	Project:	Former Taylor Lumber Site	Sampler: KK
	Weather:	Overcast 47° 1mph N	Time In/Out:

WELL DATA

Well Depth:	11.5	Well Diameter:	2"	Water Height	1.39
Depth to Water:	10.11	Screened Interval:		x Multiplier	0.162
Water Column Length:	1.39	Depth to Free Product:		x Casing Volumes	1
Purge Volume:		Free Product Thickness:		= Purge Volume	0.22
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump	Pump Intake Depth:	1' below H_2O surface	Comments	
Sampling Method:	Peristaltic Pump	Tubing Type:	0.25-inch Teflon		

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
0835				0.13							Start Purging
0836		*	Runs	Dry	while	Filling	Flow	cell			
				wait	For	Recharge	to	sample			

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-10S	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	0842	Final Depth to Water:	10.19	Did Well Dewater?	yes	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-24S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/5/17
Project:	Former Taylor Lumber Site	Sampler:	KK
Weather:	Overcast 48° 1 N	Time In/Out:	

WELL DATA

Well Depth:	17.2	Well Diameter:	2"	Water Height	3.64
Depth to Water:	13.56	Screened Interval:	—	x Multiplier	0.162
Water Column Length:	3.64	Depth to Free Product:		x Casing Volumes	1
Purge Volume:	2.36	Free Product Thickness:		= Purge Volume	0.59
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump	Pump Intake Depth:	screen	Comments	
Sampling Method:	Peristaltic Pump	Tubing Type:	0.25-inch Teflon		

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
0912				0.13							Start Purging
0917	0.59	0.59	14.21	0.13	6.36	9.9	198.1	0.65	101.8	17.4	C
0922	0.59	1.18	14.70	0.13	6.29	10.0	238.0	0.57	100.0	12.6	C
0927	0.59	1.77	15.22	0.13	6.34	10.1	249.4	0.44	91.4	3.84	C
0932	0.59	2.36	15.69	0.13	6.38	10.2	255.7	0.36	85.3	2.89	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-24S	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	0935	Final Depth to Water:	15.91	Did Well Dewater?	NO	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-15S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/5/17
Project:	Former Taylor Lumber Site	Sampler:	KK
Weather:	Overcast 52° 2 ENE	Time In/Out:	

WELL DATA

Well Depth:	12.5	Well Diameter:	2"	Water Height	9.96
Depth to Water:	2.54	Screened Interval:		x Multiplier	0.162
Water Column Length:	9.96	Depth to Free Product:		x Casing Volumes	1
Purge Volume:	4.83	Free Product Thickness:		= Purge Volume	1.61
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump	Pump Intake Depth:	Screen	Comments	
Sampling Method:	Peristaltic Pump	Tubing Type:	0.25-inch Teflon	—	

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1010				0.13							Start Purging
1022	1.61	1.61	2.74	0.13	6.54	11.4	234.6	0.27	112.9	1.58	C
1034	1.61	3.22	2.76	0.13	6.50	11.4	231.8	0.21	119.0	0.53	C
1046	1.61	4.83	2.78	0.13	6.49	11.5	232.1	0.16	123.6	0.39	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-15S	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences
Sample Time:	1048	Final Depth to Water:	2.62	Did Well Dewater?	NO

# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX	Well I.D.	MW-103S	Job Number: 320001843-01.003
	Client:	Oregon DEQ	Date: 4/5/17
	Project:	Former Taylor Lumber Site	Sampler: KK
	Weather:	Rain 54° 1 ESE	Time In/Out:

WELL DATA

Well Depth:	16.0	Well Diameter:	2"	Water Height	11.95
Depth to Water:	4.05	Screened Interval:	–	x Multiplier	0.162
Water Column Length:	11.95	Depth to Free Product:		x Casing Volumes	1
Purge Volume:	5.79	Free Product Thickness:		= Purge Volume	1.93
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump	Pump Intake Depth:	screen		Comments
Sampling Method:	Peristaltic Pump	Tubing Type:	0.25-inch Teflon		–

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1115				0.13							Start Purging
1130	1.93	1.93	5.27	0.13	6.13	12.9	359.5	0.26	165.4	1.41	C
1145	1.93	3.86	5.30	0.13	6.12	12.9	363.4	0.16	168.4	2.49	C
1200	1.93	5.79	5.33	0.13	6.12	12.9	362.6	0.13	171.2	2.72	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-103S	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences
Sample Time:	1203	Final Depth to Water:	4.61	Did Well Dewater?	NO

# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-20S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/5/17
Project:	Former Taylor Lumber Site	Sampler:	KK
Weather:	overcast 54° @ SSW	Time In/Out:	—

WELL DATA

Well Depth:	14.5	Well Diameter:	2"	Water Height	7.99
Depth to Water:	6.51	Screened Interval:	—	x Multiplier	0.162
Water Column Length:	7.99	Depth to Free Product:		x Casing Volumes	1
Purge Volume:	3.87	Free Product Thickness:		= Purge Volume	1.29
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump				Pump Intake Depth:		screen			Comments	
Sampling Method:	Peristaltic Pump				Tubing Type:		0.25-inch Teflon			—	
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1224				0.13							Start Purging
1234	1.29	1.29	7.71	0.13	6.22	10.5	243.0	0.57	126.7	12.41	C
1244	1.29	2.58	8.32	0.13	6.19	10.5	248.1	0.29	118.7	8.80	C
1254	1.29	3.87	8.98	0.13	6.19	10.6	251.6	0.19	113.9	4.96	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-20S	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1257	Final Depth to Water:	9.00	Did Well Dewater?	NO	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-19S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/5/17
Project:	Former Taylor Lumber Site	Sampler:	KK
Weather:	overcast 54° 2 WSW	Time In/Out:	

WELL DATA

Well Depth:	15.5	Well Diameter:	2"	Water Height	8.75
Depth to Water:	6.75	Screened Interval:	—	x Multiplier	0.162
Water Column Length:	8.75	Depth to Free Product:		x Casing Volumes	1
Purge Volume:	4.23	Free Product Thickness:		= Purge Volume	1.41
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump				Pump Intake Depth:		screen			Comments	
Sampling Method:	Peristaltic Pump				Tubing Type:		0.25-inch Teflon			—	
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1321				0.13							Start Purging
1332	1.41	1.41	8.22	0.13	6.09	11.1	132.8	0.44	151.6	3.74	C
1343	1.41	2.82	9.10	0.13	6.07	11.0	132.6	0.25	158.8	3.79	C
1354	1.41	4.23	9.81	0.13	6.05	11.2	134.9	0.36	162.7	4.14	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-19S	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1356	Final Depth to Water:	9.71	Did Well Dewater?	NO	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	PZ-101	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/5/17
Project:	Former Taylor Lumber Site	Sampler:	KK
Weather:	Rain 53° 4 W	Time In/Out:	

WELL DATA

Well Depth:	13.5	Well Diameter:	2"	Water Height	9.78
Depth to Water:	3.72	Screened Interval:		x Multiplier	0.162
Water Column Length:	9.78	Depth to Free Product:		x Casing Volumes	1
Purge Volume:		Free Product Thickness:		= Purge Volume	1.58
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	—

PURGING DATA

Purge Method:		Peristaltic Pump			Pump Intake Depth:		screen			Comments	
Sampling Method:		Peristaltic Pump			Tubing Type:		0.25-inch Teflon			—	
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1447				0.13							Start Purging
1459	1.58	1.58	8.54	0.13	6.28	10.6	173.1	0.42	182.6	2.43	C
1511	1.58	3.16	9.05	0.13	6.26	10.7	174.4	0.19	174.8	1.73	C
1523	1.58	4.74	9.54	0.13	6.24	10.8	176.5	0.22	164.9	1.78	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	PZ-101	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1526	Final Depth to Water:	9.41	Did Well Dewater?	NO	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

Well I.D.	PZ-102	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/5/17
Project:	Former Taylor Lumber Site	Sampler:	KK
Weather:	Rain 51° 8W	Time In/Out:	

WELL DATA

Well Depth:	12.2	Well Diameter:	2"	Water Height	8.18
Depth to Water:	4.02	Screened Interval:		x Multiplier	0.162
Water Column Length:	8.18	Depth to Free Product:		x Casing Volumes	1
Purge Volume:		Free Product Thickness:		= Purge Volume	1.32
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump	Pump Intake Depth:	Screen	Comments	
Sampling Method:	Peristaltic Pump	Tubing Type:	0.25-inch Teflon	—	

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1550				0.13							Start Purging
1600	1.32	1.32	4.31	0.13	6.79	11.2	392.2	0.39	138.0	4.62	C
1610	1.32	2.64	4.35	0.13	6.75	11.4	472.1	0.18	141.3	1.19	C
1620	1.32	3.96	4.35	0.13	6.75	11.5	487.2	0.14	140.4	0.56	C
1630	1.32	5.28	4.37	0.13	6.75	11.5	493.9	0.12	139.3	0.36	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	PZ-102	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences
Sample Time:	1632	Final Depth to Water:	4.17	Did Well Dewater?	NO

# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	—	—
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-12S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	9/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:	OVERCAST	Time In/Out:	

WELL DATA

Well Depth:		Well Diameter:	8"	Water Height	
Depth to Water:	2.90	Screened Interval:		x Multiplier	
Water Column Length:		Depth to Free Product:		x Casing Volumes	
Purge Volume:		Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:		Peristaltic Pump			Pump Intake Depth:						Comments
Sampling Method:		Peristaltic Pump			Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
0940				0.1321							Start Purging
0945	0.66	0.66	3.28	↓	6.79	10.1	874	6.33	213.6	0.46	C
0950	0.66	1.32	3.42	↓	6.75	10.1	874	6.12	204.5	0.54	C
0955	0.66	1.98	3.55	↓	6.80	10.1	873	6.08	200.3	0.59	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-12S	Sampling Flow Rate	~0.1321	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1000	Final Depth to Water:	3.34	Did Well Dewater?		
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-65	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:		Time In/Out:	

WELL DATA

Well Depth:	11.9	Well Diameter:	2"	Water Height	—
Depth to Water:	2.52	Screened Interval:	—	x Multiplier	0.162
Water Column Length:	9.38	Depth to Free Product:		x Casing Volumes	
~~Purge~~ CASING Volume:	1,519	Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:		Peristaltic Pump			Pump Intake Depth:						Comments
Sampling Method:		Peristaltic Pump			Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1005				0.1321							Start Purging
1017	1.56	1.56	2.84	↓	6.84	10.3	921	0.41	196.6	0.41	C
1029	1.56	3.12	2.88	↓	6.79	10.4	909	0.23	191.7	0.48	C
1041	1.56	4.68	2.89	↓	6.77	10.4	891	0.17	188.4	0.37	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-65	Sampling Flow Rate	0.1321	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1045	Final Depth to Water:	2.57	Did Well Dewater?	—	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-6D	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	9/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:	OVERCAST	Time In/Out:	

WELL DATA

Well Depth:		Well Diameter:	2"	Water Height	
Depth to Water:	2.90	Screened Interval:		x Multiplier	
Water Column Length:		Depth to Free Product:		x Casing Volumes	
Purge Volume:		Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump				Pump Intake Depth:					Comments	
Sampling Method:	Peristáltic Pump				Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1050				0.1321							Start Purging
1055	0.66	0.66	4.14		7.05	10.7	1748	2.67	202.7	1.41	C
1100	0.66	1.32	4.40		7.07	11.1	1773	1.97	209.0	1.53	C
1105	0.66	1.98	4.51		7.09	11.2	1786	1.79	218.2	1.89	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-6D	Sampling Flow Rate	0.13	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1110	Final Depth to Water:	4.01	Did Well Dewater?	—	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-13S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:	OVERCAST	Time In/Out:	

WELL DATA

Well Depth:	14'	Well Diameter:	2"	Water Height	
Depth to Water:	3.30	Screened Interval:		x Multiplier	
Water Column Length:	10.7	Depth to Free Product:		x Casing Volumes	
~~Purge~~ CASING Volume:	1.7334	Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump				Pump Intake Depth:					Comments	
Sampling Method:	Peristaltic Pump				Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1125				0.1321							Start Purging
1138	1.72	1.72	3.85	↓	6.45	10.9	602	1.50	389.6	0.98	C
1151	1.72	3.43	3.90	↓	6.39	10.9	616	0.92	317.9	1.33	C
1204	1.72	5.15	3.92	↓	6.36	10.8	630	0.84	302.2	1.58	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-13S	Sampling Flow Rate	0.1321	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1215	Final Depth to Water:	3.34	Did Well Dewater?	—	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-16S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:	OVERCAST	Time In/Out:	

WELL DATA

Well Depth:	13.5	Well Diameter:	2"	Water Height	
Depth to Water:	2.69	Screened Interval:		x Multiplier	
Water Column Length:	10.81	Depth to Free Product:		x Casing Volumes	
~~Purge~~ CASING Volume:	1.75122	Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump	Pump Intake Depth:				Comments
Sampling Method:	Peristaltic Pump	Tubing Type:	0.25-inch Teflon			

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1225				0.1321							Start Purging
1238	1.72	1.72	3.22	↓	6.27	12.1	318.1	0.37	239.2	8.82	C
1251	1.72	3.43	3.26	↓	6.25	12.2	322.3	0.20	233.7	7.79	C
1304	1.72	5.15	3.30	↓	6.28	12.3	338.2	0.16	226.7	5.86	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-16S	Sampling Flow Rate	0.1321	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1310	Final Depth to Water:	2.92	Did Well Dewater?	—	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA	YES	MW-16S DUP
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

Well I.D.	MW-11S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:	PARTLY SUNNY	Time In/Out:	

WELL DATA

Well Depth:	19.5	Well Diameter:	2"	Water Height	
Depth to Water:	3.25	Screened Interval:		x Multiplier	
Water Column Length:	16.25	Depth to Free Product:		x Casing Volumes	
~~Purge~~ CASING Volume:	2.63	Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:		Peristaltic Pump			Pump Intake Depth:					Comments	
Sampling Method:		Peristaltic Pump			Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1340				0.1321							Start Purging
1350	1.321	1.321	3.96	↓	7.15	11.9	910	0.30	225.7	1.04	C
1400	1.321	2.642	4.01	↓	7.15	12.1	915	0.22	217.3	0.86	C
1410	1.321	3.963	4.05	↓	7.16	12.2	919	0.15	192.8	1.19	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-11S	Sampling Flow Rate	0.1321	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1415	Final Depth to Water:	3.61	Did Well Dewater?	—	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-1S	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:	PARTLY SUNNY	Time In/Out:	

WELL DATA

Well Depth:	15.0	Well Diameter:		Water Height	
Depth to Water:	3.25	Screened Interval:		x Multiplier	
Water Column Length:	11.75	Depth to Free Product:		x Casing Volumes	
~~Purge~~ CASING Volume:	1.9035	Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:	Peristaltic Pump				Pump Intake Depth:					Comments	
Sampling Method:	Peristaltic Pump				Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1434				0.1321							Start Purging
1448	1.85	1.85	4.34	↓	7.05	12.8	1028	0.29	204.7	0.47	C
1502	1.85	3.6988	4.38		7.03	13.0	1046	0.16	204.5	0.49	C
1516	1.85	5.5482	4.41		7.03	13.1	1050	0.12	203.4	0.94	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-1S	Sampling Flow Rate	0.1321	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1520	Final Depth to Water:	3.85	Did Well Dewater?	—	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

WELL MONITORING DATA SHEET

APEX

Well I.D.	MW-25s	Job Number:	320001843-01.003
Client:	Oregon DEQ	Date:	4/6/17
Project:	Former Taylor Lumber Site	Sampler:	CC
Weather:	PARTLY CLOUDY	Time In/Out:	

WELL DATA

Well Depth:	19.3	Well Diameter:	2"	Water Height	
Depth to Water:	6.35	Screened Interval:		x Multiplier	
Water Column Length:	12.95	Depth to Free Product:		x Casing Volumes	
CASING ~~Purge~~ Volume:	2.0979	Free Product Thickness:		= Purge Volume	
Water Height Multipliers (gal)	1-inch = 0.041	2-inch = 0.162	4-inch = 0.653	1 gallon = 3.785 liters	

PURGING DATA

Purge Method:		Peristaltic Pump			Pump Intake Depth:					Comments	
Sampling Method:		Peristaltic Pump			Tubing Type:		0.25-inch Teflon				
Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	DTW (btc)	Purge Rate (gal/min)	pH	Temp (°C)	Cond (µS/cm)	DO (ppm)	ORP (mV)	Turbidity (NTUs)	Clarity/Color Other Remarks
					+/-0.1	+/-0.5° C	+/-5%	+/- 0.5 ppm	+/-20mV	+/-10%	<-- Stabilization Criteria
1525				0.1321							Start Purging
1541	2.1136	2.1236	7.21	↓	7.09	11.7	987	0.54	208.1	0.58	C
1557	2.1136	4.2272	7.27	↓	7.07	11.8	968	0.26	205.2	0.87	C
1613	2.1136	6.34	7.33	↓	7.04	11.9	943	0.15	188.7	0.49	C

Clarity: VC = very cloudy, Cl = Cloudy, SC = slightly cloudy, AC = almost clear, C = clear

SAMPLING DATA

Sample ID:	MW-25s	Sampling Flow Rate	0.1321	Analytical Laboratory:	ESC Lab Sciences	
Sample Time:	1615	Final Depth to Water:	6.61	Did Well Dewater?	—	
# Containers/Type	Preservative	Analysis/Method	Field Filtered	Filter Size	MS/MSD	Duplicate ID
2 x 100 mL Amber Gl.	Neat	8270 (PCP only)	~~yes~~ no	NA		MW-25s DUP
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			
			~~yes~~ no			

COMMENTS

Appendix B

Apex 2013 *Groundwater Monitoring Work Plan*
(on CD-ROM)

Groundwater Monitoring Work Plan
Former Taylor Lumber Site
Sheridan, Oregon

Prepared for:
Oregon Department of Environmental Quality

April 3, 2013
1843-01

Ash Creek Associates
A Division of Apex Companies, LLC
APEX

Ash Creek Associates
A Division of Apex Companies, LLC
APEX

Groundwater Monitoring Work Plan
Former Taylor Lumber Site
Sheridan, Oregon

Prepared for:
Oregon Department of Environmental Quality

April 3, 2013
1843-01

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B Sampling and Analysis Plan

1.0 Introduction

This Groundwater Monitoring Work Plan presents the scope of work for groundwater monitoring activities at the former Taylor Lumber and Treating (TLT) Superfund Site located at 22125 SW Rock Creek Road in Yamhill County, Sheridan, Oregon (Site; Figure 1). This Work Plan was prepared for the Oregon Department of Environmental Quality (DEQ) under Task 2 of Task Order No. 20-13-04. This Work Plan covers two annual monitoring events to be conducted in April 2013 and April 2014. The specific scope of work is the same for each event. A Work Plan was originally submitted to DEQ on April 25, 2011, summarizing a scope of work for two annual monitoring events in April 2011 and April 2012 (Ash Creek, 2011). This work plan has been modified slightly from the April 25, 2011 work plan to incorporate minor modifications to the project scope of work that were made based on site conditions encountered during the 2011 and 2012 groundwater monitoring events.

1.1 Background

The Site is a wood treating facility that was operated by TLT from 1946 until 2001, when TLT filed for bankruptcy. Pacific Wood Preserving of Oregon (PWPO) entered into a Prospective Purchaser Agreement with the U.S. Environmental Protection Agency (EPA) and purchased the wood treatment portion of the facility. PWPO began operations at the Site in 2002 and is currently treating wood using copper- and borate-based solutions.

A Record of Decision (ROD) for the Site was signed on September 30, 2005 (EPA, 2005). In accordance with the ROD, contaminated soils have been removed from the Site. However, contaminated soils and groundwater remain within the treatment plant area at the Site, enclosed by a soil-bentonite barrier wall. A low-permeability asphalt cap has been placed over the entire area enclosed by the barrier wall, which impedes the infiltration of stormwater into the groundwater located within the barrier wall. Four groundwater extraction wells have been installed within the barrier wall to stimulate an inward hydraulic gradient and prevent water from rising above the cap (EPA, 2010). The ROD identifies pentachlorophenol (PCP) as the contaminant of concern (COC) in Site groundwater (EPA, 2005).

1.2 Objective

The primary objective of the groundwater monitoring program is to confirm that PCP impacted groundwater is not migrating beyond the barrier wall to the Yamhill River to the south or across Rock Creek Road to residential wells.

1.3 Scope of Work

In March 2010, the EPA prepared a Long-Term Groundwater Monitoring and Reporting Plan (EPA Work Plan) for the Site (EPA, 2010). The plan outlined a groundwater monitoring program for the Site including field sampling procedures, quality assurance/quality control (QA/QC) evaluation, sampling handling, and documentation procedures. This Work Plan incorporates the major components of the EPA Work Plan. The following scope of work, as excerpted from the EPA Work Plan, will accomplish the primary project objective as described in Section 1.2:

1) Groundwater samples will be collected for PCP analysis from 19 monitoring wells located outside the barrier wall.
2) Groundwater samples will be collected for PCP analysis from residential well RW-01. Note: residential well RW-02 was included in the EPA Work Plan; however, during the 2011 annual monitoring event, it was discovered that the RW-02 well pump was damaged and the well was no longer used by the residence. Therefore, residential well RW-02 has been removed from the sampling scope for the Site.
3) Water quality parameters will be measured prior to sampling to determine water stability during purging and to qualify the representativeness of the samples.
4) Water levels will be measured in each of the above-referenced monitoring wells as well as in extraction wells PW-01 through PW-04, located within the barrier wall.
5) For health and safety purposes, organic vapors will be measured in the well headspace prior to monitoring and sampling activities.

These activities are discussed in further detail within this Work Plan. Table 1 lists the groundwater and residential wells that will be gauged and sampled as part of the Site monitoring program. The location of the monitoring, extraction, and residential wells included in the monitoring program are shown on Figure 2.

2.0 Groundwater Monitoring Activities

The groundwater monitoring program will include preparatory activities, collection of groundwater elevation measurements, and collection of groundwater samples for chemical analysis.

2.1 Preparatory Activities

Site Health and Safety Plan. A Site-specific health and safety plan (HASP) has been prepared for the proposed activities. Appendix A includes a copy of the HASP. The HASP was prepared in general accordance with the Occupational Safety and Health Act (OSHA) and the Oregon Administrative Rules (OAR). A copy of the HASP will be maintained on-site during the field activities.

Property Access. PWPO will be contacted a minimum of one week prior to each field event. Prior to entering the site, field staff will also check in at the PWPO main office. The main office is located at 22125 Rock Creek Road, with the primary entrance located off Highway 18B.

Residential Notifications. Two monitoring wells (MW-9S and MW-11S) and one residential water well (RW-01) are located off-site, as shown on Figure 2. The owners of these properties will be notified by telephone one week prior to sampling, if possible. If they cannot be reached by telephone, they will be contacted, in person, at the beginning of the monitoring event. Contact information for the residents is provided in the EPA Work Plan (EPA, 2010) and in Table 1.

2.2 Documentation of Well Conditions

Prior to sampling, Site conditions will be recorded including temperature, precipitation, wind direction, and any other factors that could affect sample quality. The well monuments will be inspected for signs of damage, and will be noted accordingly in the field notes.

Prior to sampling, the headspace around each well will be screened for organic vapors using a photoionization detector (PID). Headspace concentrations will be documented in the field notes and any volatiles will be allowed to dissipate before sampling.

2.3 Groundwater Elevation Measurements

Groundwater elevation measurements will be collected in accordance with the EPA Work Plan (EPA, 2010). Wells in which water levels will be measured are listed in Table 1. It is possible there will be a difference in air pressure between the air in the casing and barometric pressure at the time of collecting well measurements. Since such a differential pressure could affect water level results, the well lids and caps will be opened for at least five minutes before making measurements so that the air pressure has adequate time to equilibrate. Water level measurements will be measured with an electronic water level probe and recorded on the appropriate field data sheet with an accuracy of ± 0.01 foot.

2.4 Groundwater Sampling

Groundwater samples will be collected from the wells listed in Table 1.

Well Purging. Groundwater will be purged before sampling using dedicated Teflon tubing and a peristaltic pump. Field parameters, including temperature, pH, dissolved oxygen, oxidation-reduction potential, specific conductivity, and turbidity will be collected during the purging process using a flow-through cell. Detailed groundwater sampling procedures are described in the sampling and analysis plan (SAP; Appendix B).

The well purging scope for monitoring well MW-12s has been modified from the procedure outlined in the SAP. Monitoring well MW-12s is constructed of 6-inch-diameter PVC casing and is approximately 12 feet deep. It would take approximately 4.5 hours to purge three well volumes, as proposed in the SAP, prior to sampling. In order to collect a groundwater sample representative of the aquifer in an efficient timeframe, field parameters will be measured every 5 minutes while purging the well. Once pH and temperature conditions reach values similar to results for the other wells at the Site, and the other field parameters are stabilized (dissolved oxygen, turbidity, etc.), the well will be considered adequately purged and ready for sampling. The total volume purged during each gauging event will be recorded in the field notes.

Well Sampling. Groundwater sampling will be conducted in accordance with Ash Creek's standard operating procedures (SOPs) which are included in the SAP (Appendix B). Where the SOPs differ from the EPA Work Plan, procedures are typically deferred to those outlined in the EPA Work Plan, and are denoted accordingly in the SAP.

Purging and Sampling of Residential Wells. The location of off-site residential well RW-01 is shown on Figure 2. Well RW-01 is located to the west of the Site and will be accessed from the faucet at the pump house that is facing Highway 18.

The water tap will be opened and allowed to run for approximately 10 minutes to clear the system (including a pressure equalizing tank, if present) of residual water in the piping. Following the system purge, a sample will be collected from the tap for measurement of field parameters. The tap will be allowed to run for another 3 minutes before collecting another sample for the measurement of field parameters (pH, electrical conductivity, temperature). This procedure will be repeated until field parameters stabilized to within 10 percent of the previous measurements for three successive measurements. Following completion of "purging" procedures as described above, the groundwater sample will be collected directly from the tap.

Procedures for labeling and storing the samples are summarized in the SAP (Appendix B).

2.5 Handling of Investigation-Derived Waste

Investigation-derived waste (IDW) will consist of purge water and decontamination water. IDW will be temporarily placed in buckets or drums and will be transported to and disposed of in the drain located to the north of the stormwater treatment system (Figure 2). At a minimum, buckets will be emptied into the drain prior to the end of each field day. Disposable items, such as gloves, paper towels, etc., will be placed in plastic bags after use and deposited in trash receptacles for disposal.

3.0 Analytical Program

Groundwater samples collected from the monitoring wells and residential water well during both monitoring events will be analyzed for PCP by EPA Method 8270 SIM. Additional information on the analytical program, including sample handling procedures, required analytical reporting limits, preservation requirements, and sample hold times, are summarized in the SAP (Appendix B).

4.0 Quality Assurance and Quality Control

QA/QC procedures will be used throughout this project. The SAP in Appendix B includes the QA plan for this project. This plan includes sampling and custody procedures, QA sampling analyses (such as analysis of duplicates), detection limit goals, laboratory QC, and QA reporting. Groundwater sampling will be conducted in accordance with the QA/QC requirements outlined in the EPA Work Plan (EPA, 2010).

5.0 Annual Reporting

Following each annual monitoring event, a groundwater monitoring report will be prepared and submitted to the DEQ. The quarterly monitoring report will include the following components:

- A brief summary of field events;
- Analytical laboratory testing program and documentation (including a QA review);
- A summary table of validated groundwater monitoring results collected during the year and compared to historical groundwater monitoring data for the site;
- A summary table of water level elevation measurements;
- Water level elevation contour maps;
- Time-series plots for all wells that routinely show detections of contaminants;
- A water level contour map;
- A figure depicting well locations with contaminant concentrations from 2011 through the most recent sampling period; and
- A conclusion section that interprets the groundwater data and discusses the efficacy of the barrier wall.

The 2013 and 2014 annual monitoring reports will be submitted to DEQ as final documents (no prior submittal as draft documents).

6.0 References

Ash Creek Associates (Ash Creek), 2011. *Groundwater Monitoring Work Plan Former Taylor Lumber Site, Sheridan, Oregon.* April 22, 2011.

U.S. Environmental Protection Agency (EPA), 2005. *Final Record of Decision Taylor Lumber and Treating Superfund Site, Sheridan, Oregon.* September 30, 2005.

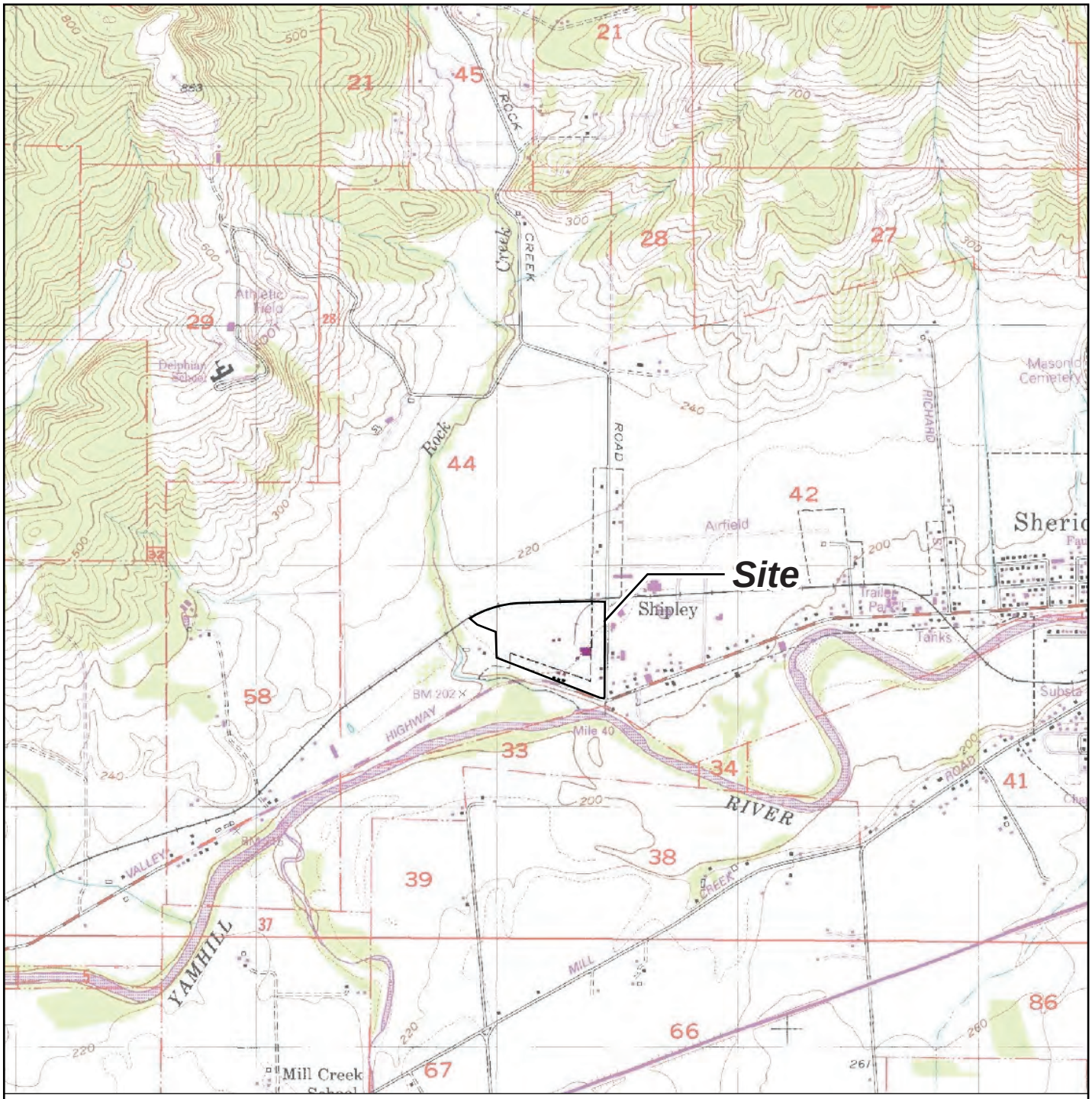
EPA, 2010. *Long-term Groundwater Monitoring and Reporting Plan. Taylor Lumber and Treating Superfund Site.* March, 2010.

Table 1
Monitoring Program
Taylor Lumber and Treating

Well I.D.	Wells to be Sampled	Water Level Measurments*
Outside Barrier Wall		
MW-1S	X	X
MW-6S	X	X
MW-6D	X	X
MW-12S	X	X
MW-13S	X	X
MW-15S	X	X
MW-16S	X	X
MW-19S	X	X
MW-20S	X	X
MW-25S	X	X
MW-103S	X	X
PZ-101	X	X
PZ-102	X	X
PZ-105	X	X
South of Highway 18B		
MW-9S	X	X
MW-10S	X	X
MW-24S	X	X
East of Rock Creek Road		
MW-11S	X	X
Residences**		
RW-01	X	
Extraction Wells Inside Barrier Wall		
PW-1		X
PW-02		X
PW-03		X
PW-04		X

1. PCP = pentachlorophenol.
2. * = Indicates wells in which water level measurements will be collected.
3. ** = Residential addresses and contact information are as follows:

RW- 01: (b)(6) - Residential property owned by (b)(6)
MW-9S: Residential property owned by (b)(6)
MW-11S: Northwest Gazebo - George Gabriel owner - 503-843-0024



Note: Base map prepared from USGS 7.5-minute quadrangle of Sheridan, OR, revised 1992 as provided by MSR Maps.com.

0 2,000 4,000

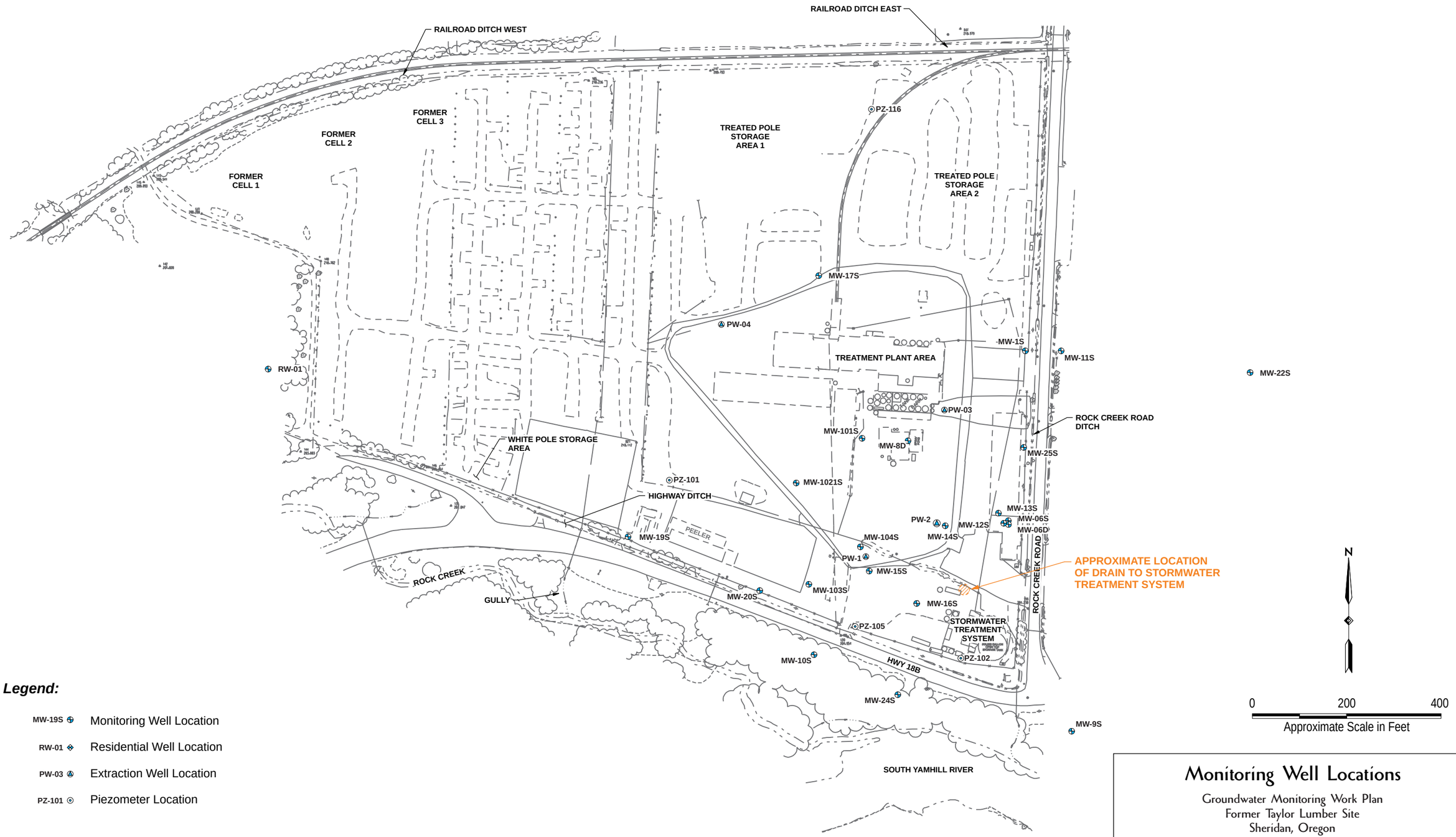
Approximate Scale in Feet

N

Site Location Map

Groundwater Monitoring Work Plan
Former Taylor Lumber Site
Sheridan, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1843-01	Figure
	April 2013		1



Legend:

MW-19S	Monitoring Well Location
RW-01	Residential Well Location
PW-03	Extraction Well Location
PZ-101	Piezometer Location

NOTE: Base map prepared from a CH2MHILL Monitor Well Plan (6/11/2009).

Monitoring Well Locations

Groundwater Monitoring Work Plan
Former Taylor Lumber Site
Sheridan, Oregon

Apex Companies, LLC
3015 SW First Avenue
Portland, Oregon 97201

Project Number	1843-01	Figure
April 2013		2

Appendix A

Health and Safety Plan

Record of Health and Safety Communication

PROJECT NAME: DEQ - Former Taylor Lumber Project

SITE CONTAMINANTS: Pentachlorophenol

PPE REQUIREMENTS (check all that apply):

- [x] Safety Glasses
- [x] Safety Boots
- [x] Hard Hat
- [x] Gloves :
- [x] Clothing : Safety Vest
- [ ] Respiratory Protection :
- [ ] Other :

The following personnel have reviewed a copy of the Summary Information regarding the Site, and the General Health and Safety Plan (and attachments). By signing below, these personnel indicate that they have read the plan, including all referenced information, and that they understand the requirements which are detailed for this project.

PRINTED NAME	SIGNATURE	COMPANY	DATE

1.0 Introduction

This Health and Safety Plan (HASP) includes both Site-specific information (including Site-specific activities, health hazards, route to hospital, and toxicity information) and the general Apex Companies, LLC. (Apex) Health and Safety Plan (General HASP).

1.1 Emergency Contact Summary

SITE LOCATION	22125 SW Rock Creek Road, Sheridan, OR
NEAREST HOSPITAL	West Valley Hospital 525 Southeast Washington Street Dallas, OR 97338-2834 (See HASP-1) Telephone ..... (503) 842-4444
EMERGENCY RESPONDERS	Police Department ..... 9-1-1 Fire Department ..... 9-1-1 Ambulance 9-1-1
EMERGENCY CONTACTS	Ash Creek Associates ..... (503) 924-4704 National Response Center ..... (800) 424-8802 Oregon Accident Response System ..... (800) 452-0311 Environmental Response Team ..... (503) 283-1150 Poison Control Center ..... (800) 222-1222 Chemtrec ..... (800) 424-9300

In the event of an emergency, call for help as soon as possible. Give the following information:

- WHERE the emergency is (use cross-streets or landmarks)
- PHONE NUMBER you are calling from
- WHAT HAPPENED (type of injury)
- HOW MANY persons need help
- WHAT is being done for the victim(s)
- YOU HANG UP LAST (let the person you called hang up first)

2.0 Corporate Health and Safety Plan

The Apex General HASP, together with the included Site-specific information, cover each of the 11 required plan elements as specified in OSHA 1910.120, and meets all applicable regulatory requirements. The reader is advised to thoroughly review the entire plan.

3.0 Site-Specific Health and Safety Plan

3.1 Site Location and Description

LOCATION: 22125 SW Rock Creek Road, Sheridan, OR

LAND USE OF AREA SURROUNDING FACILITY: Industrial

3.2 Site Activity Summary

SITE ACTIVITIES: Groundwater sampling.

PROPOSED DATE OF ACTIVITY: April 2013 and April 2014.

POTENTIAL SITE CONTAMINANTS: Pentachlorophenol.

POTENTIAL ROUTES OF ENTRY: Potential routes of entry include skin contact with soil and groundwater, incidental ingestion of soil and groundwater, and inhalation of dust and volatiles.

PROTECTIVE MEASURES: Engineering controls, safety glasses, safety boots, hard hat, gloves, protective clothing, and respirators (as necessary).

MONITORING EQUIPMENT: Photoionization detector (PID) with 10.2 eV Lamp; olfactory indications.

3.3 Chain of Command

The chain of command for health and safety in this project involves the following individuals:

CORPORATE HEALTH AND SAFETY MANAGER: Adam Reese

PROJECT MANAGER: Stephanie L. Bosze, R.G..

PROJECT HEALTH AND SAFETY OFFICER: Stephanie L. Bosze, R.G.

FIELD HEALTH AND SAFETY MANAGER: Mike Whitson

3.4 Hazard Analysis and Applicable Safety Procedures

The following work tasks will be accomplished:

1) Groundwater sampling

The associated hazards for the above activities that may be anticipated during this project are discussed in detail below.

3.4.1 Groundwater Monitoring.

Any sampling will occur under the assumption the media is contaminated and appropriate personnel protection will be required.

3.4.2 Air Monitoring and Action Levels

PID Monitoring. Air monitoring will be conducted with a PID with 10.2 eV lamp, or equivalent, to measure organic vapor concentration during Site work activities (the 10.2 eV lamp is specified to allow detection of halogenated compounds). Background PID measurements will be taken prior to the start of groundwater monitoring to quantify levels associated with the ambient air space in the vicinity of the Site. Subsequent PID measurements will be taken when well caps are initially removed for sampling. If PID measurements are elevated relative to the previously measured background levels, then sampling will be deferred to allow vapors to dissipate. PID measurements shall be consistent with background prior to sampling activities.

Olfactory. If olfactory senses detect any unfamiliar odor, work will stop until an assessment can be made to determine whether the need exists to upgrade protective measures.

3.5 Chemicals of Concern

Based on Site information gathered to date, the following chemical may be present at the Site:

- Pentachlorophenol (PCP)

3.5.1 Toxicity Information

Pertinent toxicological properties of the chemicals of concern are discussed below. This information generally covers potential toxic effects which may occur from relatively significant acute and/or chronic exposures, and is not meant to indicate that such effects will occur from the planned Site activities. In general, the chemicals which may be encountered at the Site are not expected to be present at concentrations that could produce significant exposures. The types of planned work activities should also limit potential exposures at the Site. Furthermore, appropriate protective and monitoring equipment will be used, as discussed below, to further minimize any exposures that might occur.

Standards for occupational exposures to these chemicals are included where available. Site exposures are generally expected to be of short duration and well below the level of any of these exposure limits. These standards are presented below.

PEL Permissible Exposure Limit (Occupational Safety and Health Act [OSHA])

REL Recommended Exposure Limit (NIOSH)

IDLH Immediately Dangerous to Life and Health (NIOSH)

TWA Time-Weighted Average (exposure limit for any eight-hour work shift of a 40-hour work week)

STEL Short-Term Exposure Limit (expressed as a 15-minute, time-weighted average, and not to be exceeded at any time during a work day)

C Ceiling Exposure Limit (not to be exceeded at any time during a work day)

The table below lists the exposure limits recommended by OSHA and NIOSH for each of the listed compounds. Respiratory protection will be required if measured concentrations in air exceed the minimum of these exposure limits.

Recommended Exposure Limits

Compound	OSHA PEL [ppm]	NIOSH REL [ppm]	IDLH [ppm]	TWA [ppm]
Pentachlorophenol	0.05	0.05	0.25	0.05

Note: ppm = Parts per million.

Pentachlorophenol. Pentachlorophenol is a synthetic substance, made from other chemicals, and does not occur naturally in the environment. It is made by only one company in the United States. At one time, it was one of the most widely used biocides in the United States. Since 1984, the purchase and use of pentachlorophenol has been restricted to certified applicators. It is no longer available to the general public. Application of pentachlorophenol in the home as an herbicide and pesticide accounted for only 3% of its consumption in the 1970s. Before use restrictions, pentachlorophenol was widely used as a wood preservative. It is now used industrially as a wood preservative for power line poles, cross arms, fence posts, and the like. Pure pentachlorophenol exists as colorless crystals. It has a very sharp characteristic phenolic smell when hot but very little odor at room temperature. Most people can begin to smell pentachlorophenol in water at less than 12 parts pentachlorophenol per million parts of water (ppm). Impure pentachlorophenol (the form usually found at hazardous waste sites) is dark gray to brown and exists as dust, beads, or flakes. Pentachlorophenol can be found in two forms: pentachlorophenol itself or as the sodium salt of pentachlorophenol. The sodium salt dissolves easily in water, but pentachlorophenol does not. These two forms have some different physical properties, but are expected to have similar toxic effects. Humans are generally exposed to technical-grade pentachlorophenol, which usually contains such toxic impurities as polychlorinated dibenzo- p-dioxins and dibenzofurans.

The physical and chemical properties of the compound suggest that not much will evaporate into the atmosphere and that most of it will move with water and generally stick to soil particles. Movement of pentachlorophenol in soils depends on the soil's acidity. The compound can be present in fish or other species used for food, as demonstrated by the ongoing food monitoring program of the Food and Drug

Administration (FDA). In air, soil, and surface water, pentachlorophenol lasts for hours to days. The compound is broken down in soil and surface water by microorganisms, and in air and surface water by sunlight, to other compounds, some of which may be harmful to humans.

Pentachlorophenol easily enters your body through your lungs when you breathe it, through your digestive tract after you eat contaminated food or water, or through your skin. The most significant ways are through breathing and skin contact. After a short exposure period, pentachlorophenol quickly leaves your body (studies in humans show that half the amount taken in is usually gone within 33 hours). It does not seem to build up in the body very much. Most of the pentachlorophenol taken into your body does not break down, but instead leaves in your urine. Much smaller amounts leave in your feces. Only a small amount escapes through your exhaled air. Some of the pentachlorophenol taken into your body is joined with other natural chemicals that make the pentachlorophenol less harmful. The combined product can then leave your body more easily.

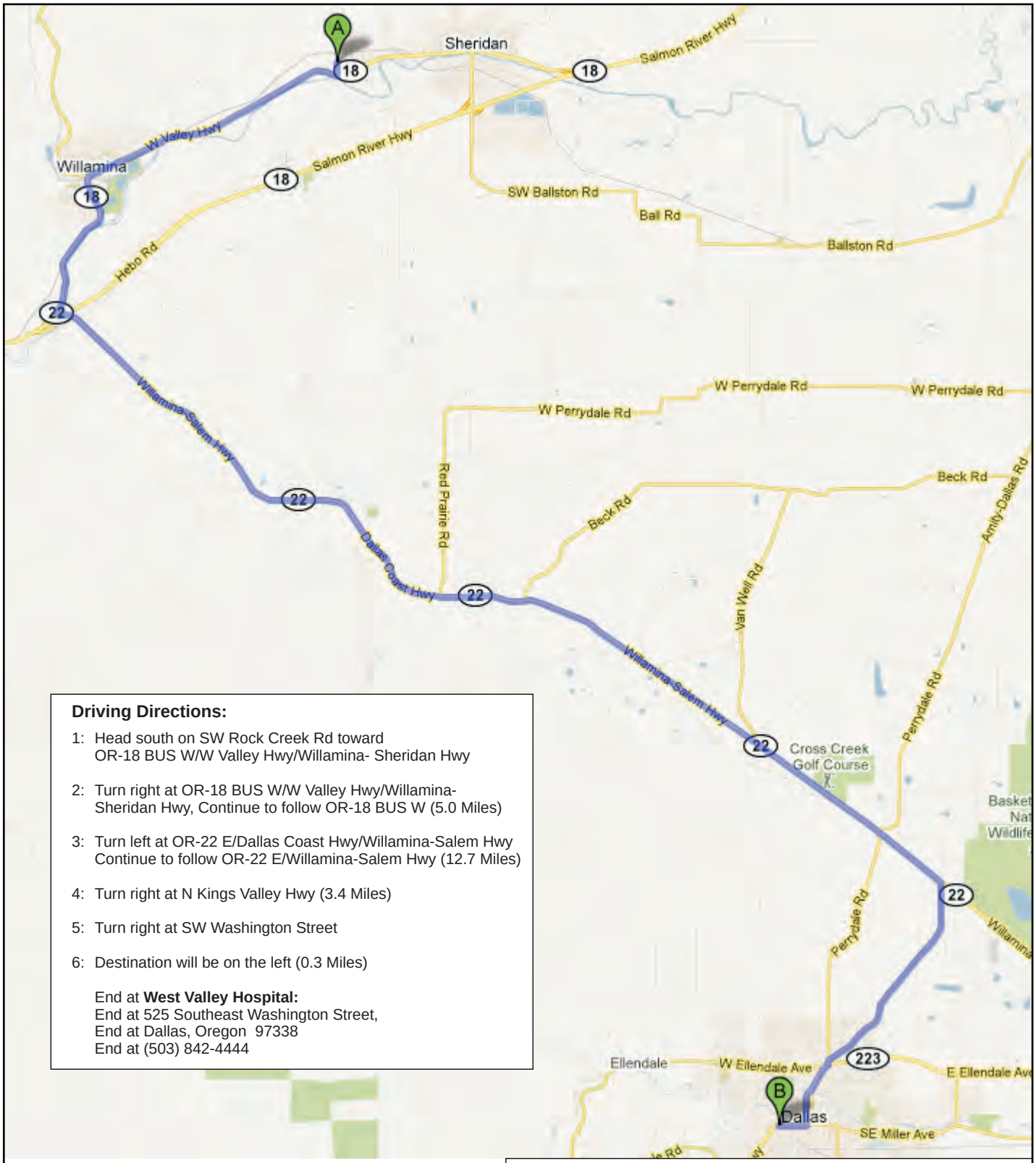
Some, but not all, of the harmful effects associated with exposure to pentachlorophenol are due to impurities present in commercial pentachlorophenol. Short exposures to large amounts of pentachlorophenol in the workplace or through the misuse of products that contain it can cause harmful effects on the liver, kidneys, blood, lungs, nervous system, immune system, and gastrointestinal tract. Contact with pentachlorophenol (particularly in the form of a hot vapor) can irritate the skin, eyes, and mouth. If large enough amounts enter the body, heat is produced by the cells in the body, causing an increase in body temperature. The body temperature can increase to dangerous levels, causing injury to various organs and tissues and even death. This effect is the result of exposure to pentachlorophenol itself and not the impurities. The lengths of exposure and the levels that cause harmful effects have not been well defined. Long-term exposure to low levels such as those that occur in the workplace can cause damage to the liver, kidneys, blood, and nervous system. Studies in animals also suggest that the endocrine system and immune system can also be damaged following long-term exposure to low levels of pentachlorophenol. All of these effects get worse as the level of exposure increases. Decreases in the number of newborn animals, harmful effects on reproductive organs of the mothers, decreases in the number of successful pregnancies, and increases in the length of pregnancy were observed in animals exposed to pentachlorophenol while they were pregnant. Harmful effects on reproductive organs of the females were also seen in animals exposed to pentachlorophenol while they were not pregnant. We do not know if pentachlorophenol produces all of the same effects in humans that it causes in animals.

An increased risk of cancer has been shown in some laboratory animals given large amounts of pentachlorophenol orally for a long time. There is weak evidence that pentachlorophenol causes cancer in humans. The International Agency for Research on Cancer (IARC) has determined that pentachlorophenol is possibly carcinogenic to humans, and the EPA has classified pentachlorophenol as a probable human carcinogen.

The federal government has set regulatory standards and guidelines to protect workers from the possible health effects of pentachlorophenol in air. OSHA has set a legally enforceable limit of 0.5 milligrams per cubic meter (mg/m3) in workroom air to protect workers during an 8-hour shift over a 40-hour work week.

Pentachlorophenol and its products can be measured in the blood, urine, and tissues of exposed persons. Because urine and blood samples are easily collected, testing these fluids is the best way to find out whether a person has been exposed. Neither test is usually available at a doctor's office because both require the use of special equipment. Although these tests can prove that a person has been exposed, they cannot be used to tell how severe any health effects might be. Because pentachlorophenol leaves the body fairly quickly, these tests are best for finding exposures that occurred within the last several days. Exposure at hazardous waste sites usually includes exposure to other organic compounds, such as hexachlorobenzene, that could break down into pentachlorophenol. On the other hand, measurement of blood and urine levels for pentachlorophenol and its products in groups of exposed people and non-exposed people is a good way to tell whether exposure to pentachlorophenol or members of the same chemical family occurred.

The federal government has also set regulatory standards and guidelines to protect the public from the possible health effects of pentachlorophenol in drinking water. EPA decided that the amount in the drinking water should not be more than 0.022 milligram per liter (mg/L) and that any release of more than 10 pounds to the environment should be reported. For short-term exposures, EPA decided that drinking water levels should not be more than 1.0 mg/L for 1 day or 0.3 mg/L for 10 days. EPA also estimates that for an average-weight adult, exposure to 0.03 mg/kg/day will probably not cause any non-cancer health effects. EPA is now working to measure the levels of pentachlorophenol found at abandoned waste sites.



Driving Directions:

1: Head south on SW Rock Creek Rd toward OR-18 BUS W/W Valley Hwy/Willamina- Sheridan Hwy

2: Turn right at OR-18 BUS W/W Valley Hwy/Willamina-Sheridan Hwy, Continue to follow OR-18 BUS W (5.0 Miles)

3: Turn left at OR-22 E/Dallas Coast Hwy/Willamina-Salem Hwy Continue to follow OR-22 E/Willamina-Salem Hwy (12.7 Miles)

4: Turn right at N Kings Valley Hwy (3.4 Miles)

5: Turn right at SW Washington Street

6: Destination will be on the left (0.3 Miles)

End at **West Valley Hospital:**
End at 525 Southeast Washington Street,
End at Dallas, Oregon 97338
End at (503) 842-4444

N

Base map prepared from 2011 Google Map data.

Route to Hospital

Groundwater Monitoring Work Plan
Former Taylor Lumber Site
Sheridan, Oregon

APEX Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1843-01	Figure
	April 2013		HSP-1

Apex Companies, LLC

Health and Safety Manual

Last Revised November 1, 2012

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1.0 HEALTH AND SAFETY AT APEX

At Apex, safety is not only a part of our business; it is foundational to our culture. We understand that in order to protect our staff and stakeholders from injury, illness or other loss, safety and security must be valued as much as all of our other core values. Apex is committed to providing a safe, healthy and secure work environment for our employees, clients, subcontractors and visitors through our WorkSafe program. We achieve our WorkSafe goals through partnership with our leadership, managers, and staff. We collaborate to ensure that our overall commitment to safety is translated in a way that can easily be applied to our day-to-day working activities.

Apex's WorkSafe program is based upon the following principles:

- Occupational injuries and illnesses are preventable
- Safety is everyone's responsibility
- Working safely is a condition of employment
- Compliance with all applicable safety, health and environmental requirements is paramount

The integrity of our WorkSafe program is ensured through sensible hiring and employment practices including pre-employment background screening, medical monitoring, and comprehensive on-going safety training that begins on every employee's first day with Apex.

Beyond these basic practices, we believe that establishing good communication concerning health, safety and security issues is critical to the success of our program. We have initiated continuous improvement in proactive hazard recognition, risk assessment and controls to prevent accidents, including an emphasis on reporting near misses, as well as broadly reporting and communicating incidents electronically so that employees at every level are quickly informed of current issues and lessons learned are shared. Our Corporate Safety Committee reinforces our culture of safety at the office level and is comprised of staff members who serve as the on-site safety point-of-contact at every office location. Apex's internal health and safety website is a portal through which employees can easily find information on our most recent incidents, near misses, shared best practices, a repository of documents, a list of experts in different disciplines, a list of local site safety leaders, recent safety news, and much more. Through these many company-wide collaborations, we are continuously improving our WorkSafe program and investing in our commitment to working safely and securely, every day.

Apex's unwavering safety goal is zero incidents, and as a result of our strong safety culture, everyone feels responsible for safety and pursues it on a daily basis. We go beyond the call of duty to identify unsafe conditions and behaviours, and we intervene to correct them. We never lose sight of our primary WorkSafe goal, ZERO INCIDENTS.

WHO IS APEX?

Apex is a customer-focused company that delivers environmental, health, safety, and engineering services to clients across the Unites States and abroad. Driven by an entrepreneurial spirit and a dedication to providing responsive, cost-effective solutions, Apex has grown rapidly since our founding in 1988.

Working in partnership with our public and private sector clients, we provide services tailored to support each customer's unique goals and objectives. By blending strong technical skills, business acumen, and superior customer service, we deliver creative solutions that produce high quality results at low cost.

From commercial and industrial firms to construction, petroleum, and utility companies to financial institutions and government clients, Apex has extensive experience in a wide variety of industries and proven capabilities in the areas of water, land, air, and facilities.

CORPORATE MISSION

Apex provides high quality, cost effective business solutions to environmental, health and safety issues. We know that in order to be successful, we must serve our clients better than anyone else.

To do this, we will:

- Attract, motivate, and retain the best people in the business
- Empower our people to act, unencumbered by bureaucracy
- Foster healthy, open, and safe working environment
- Continually strive to improve both our quality and our cost effectiveness through innovation and creative management
- Maintain an energy level and excitement about our work

... to better serve our clients.

References

No references for this section.

2.0 HEALTH AND SAFETY CONTROL

PURPOSE

The H&S Manual specifies the various management policies, operating guidelines, responsibilities and other elements of Apex's H&S Programs which are designed to protect employees from workplace hazards. The H&S Program and Training elements should be implemented and followed by Apex personnel during completion of tasks associated with various project-related work activities, such as, but not limited to:

Environmental Site Investigations

- Monitoring Well Installation
- Soil, Groundwater and Air Sampling
- Pumping Tests
- Groundwater and Contaminant Fate and Transport Modeling

Environmental Remediation

- Groundwater Extraction and Treatment
- Soil Vapor Extraction
- Soil Stabilization/Removal
- Implementation of Innovative Remediation Technologies
- Underground/Aboveground Storage Tank Closures and Installations
- Confined Space Activities
- Soil and Groundwater Remediation
- Hazardous Waste Site Investigations and Cleanup
- Hazardous Materials Management and Transportation
- Hazardous Waste Treatment, Storage and Disposal Operations
- Decontamination and Environmental Restoration Activities

Water and Wastewater

- Municipal Water Supply and Distribution Systems
- Wastewater Collection and Pumping Systems
- Industrial Wastewater Treatment Systems

Construction Management

- Construction Management
- Construction Supervision
- Resident Engineering/Quality Control Inspection

Operation and Maintenance

- Environmental Remediation Systems
- Water and Wastewater Pumping and Treatment Systems

Asbestos/Lead-Based Paint/Mold

- Sample Collection and Analysis

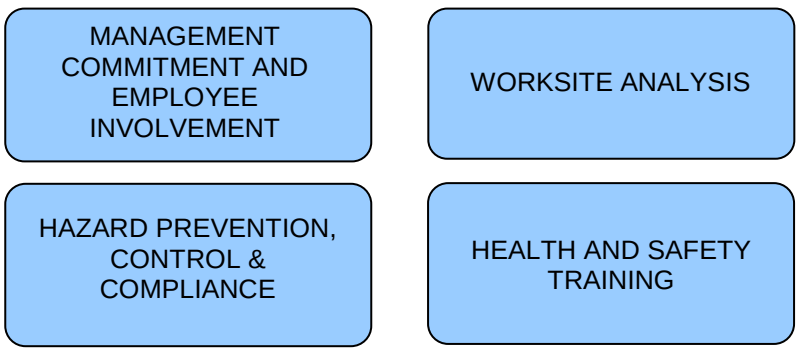
- Inspections and Assessment Surveys
- Abatement

Storm water System Management

- Initial Clearing and Maintenance
- Emergency Response

Elements identified in the H&S Manual are based upon years of experience, knowledge, applicable regulatory requirements and technical guidance.

Key H&S components are based on guidelines developed by the U.S. Occupational Safety and Health Administration (OSHA) as a result of its extensive experience in evaluating successful safety and health programs in general industry and construction. The four fundamental elements of effective safety and health management programs are summarized below (see Figure). Their specific implementation forms the core of Apex's H&S Program.



The four fundamental elements of a successful H&S

MANAGEMENT COMMITMENT AND EMPLOYEE INVOLVEMENT

Management commitment and support at all organizational levels provide the motivating force and resources necessary for the success of an effective H&S Program. Management's responsibilities include:

- Effectively communicating the H&S Program's policy and goals to all organizational levels;
- Creating and supporting a Central Safety Committee (CSC) to ensure a strong H&S Program that becomes self-sustaining;
- Instilling the concept that all individuals are personally responsible for the protection of themselves, the workplace and their co-workers;
- Enforcing all H&S policies by following the Human Resources corrective action policy. Employees failing to adhere to established safety procedures will be subject to progressive disciplinary actions, up to and including possible termination of employment, depending on the severity of the infraction(s); and

- Accountability under the H&S Program for their business unit's H&S performance. H&S is included as a critical element of manager or supervisor job performance and incentive compensation plans, with measurable criteria established for evaluating their effectiveness.

WORKSITE ANALYSIS

Various worksite inspection methods, coupled with identifying existing and potential future hazardous conditions, can be an effective means for ensuring the protection of employee safety and health. Examples of some of the commonly used worksite hazard identification techniques include:

HAZARD RECOGNITION

Introduction

Hazardous waste sites pose a multitude of health and safety concerns, any one of which could result in serious injury or death. These hazards are a function of the site as well as a consequence of the work being performed. Proper recognition of hazards associated with a site during work plan and SSHSP development allow for mitigation of risk through preparedness.

Routes of Exposure

There are only four routes of exposure (pathways) for substances to enter the human body, these are:

- Absorption through physical contact with skin, eyes, hair
- Inhalation
- Ingestion
- Injection

The primary function of the skin is to act as a barrier against entry of foreign materials to the body. If this protective barrier is overcome, toxins or other chemicals may enter. The protection is greatly diminished by lacerations and abrasions. Also, many organic solvents increase the permeability of the skin to materials that would otherwise not pass through it. The skin provides a large surface area for contact. Concentration, duration and area of contact are important variables in assessing exposure.

Inhalation is the most rapid route, immediately introducing toxins or other chemicals to respiratory tissues and the bloodstream. Once admitted to blood through the lungs, these agents are quickly transported and deposited throughout the body.

Health hazards to personnel from ingestion of materials represents a lesser concern than skin and respiratory hazards through good hygiene and work practices (unless engulfed or entrapped in a substance). The number of substances that can be ingested is limited – that is, it

is difficult to swallow vapors and gases. The risk of toxicity by ingestion is of a lower order of magnitude because the gastrointestinal lining resists the transport of many toxic agents.

Injection, although uncommon, may represent a source of significant exposure. Care must be taken to avoid sharp objects that may puncture PPE, work clothing or skin.

Host Reactions to Exposure

Generally, a given amount of a substance will elicit a specific type and intensity of response. This dose-response relationship is the basis for measurement of the relative harmfulness of a chemical. As humans are not utilized as test organisms, most toxicological data are derived from other mammalian species, and results extrapolated to humans. Test organisms are selected for their ability to simulate human response. For example, most skin tests are performed on rabbits because their skin response most closely resembles that of humans.

In much toxicological testing, the measured response is death. The dose is the amount of chemical administered to the test subject, expressed in milligrams (mg) of test agent per kilogram (kg) of body weight. The test data are then plotted on a dose-response curve. From this curve the dose that killed various percentages of the test organisms may be calculated. This is known as a lethal dose percentage. Most often, tests are conducted to determine the measured dose that kills 50 % of the test subjects. This is known as lethal dose 50 or LD50 and is a relative measure of toxicity. If compound A has an LD50 = 1000 mg/kg and compound B has an LD50 = 500 mg/kg, compound B is relatively twice as toxic as compound A. The value utilized for inhalation exposures is the lethal concentration 50 or LC50 and is expressed as parts per million (ppm) of agent per exposure hour.

Another important factor to consider when determining the toxicity of a material is the relationship between concentration and exposure time. Generally, an acute response refers to a large dose received over a short period of time. A chronic exposure is one that is generally a similar concentration received over a long period of time. The difference (in terms of deleterious effects) is that a small acute exposure may result in no effect on an organism, while a chronic exposure to the same dose may develop an additive effect. However, a large acute exposure of some substances may be significantly more hazardous than the same dose received over a longer period of time.

Limits of Exposure

In addition to the LD50 and LC50 there are several other limits useful in assessing the relative hazards of a particular substance or material. OSHA's published regulatory requirements for occupational exposures are expressed in terms of several different limits:

- ***Permissible Exposure Limit (PEL)***-OSHA regulated permissible exposure limit, which is a time-weighted average that must not be exceeded during any 8-hour work shift.
- ***Ceiling Limit (C)***-OSHA regulated exposure limit which must not be exceeded during any part of the workday.

- ***Short Term Exposure Limit (STEL)***-OSHA regulated exposure limit, which must not be exceeded within any 15-minute period of the workday.
  Recommended Exposure Limit (REL)
- National Institute of Occupational Safety and Health (NIOSH) recommended exposure limit representing time-weighted average concentrations to which an employee may be exposed for up to a 10-hour workday during a 40-hour workweek.
- ***Threshold Limit Value (TLV)***-American Conference of General Industrial Hygienists (ACGIH) recommended exposure limit for which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects.
- ***Immediately Dangerous to Life and Health (IDLH)***-Mine Safety and Health Administration (MSHA) established exposure limit above which only a highly reliable breathing apparatus providing, maximum working protection, is permitted.
- NIOSH refined this definition to a condition "that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment".

Chemical Hazards

Fire Prevention

Thermal hazards generally come from fires and explosions. There can also be a problem from heat stress due to weather conditions or from working with PPE. Two primary methods of preventing thermal injury from fire or explosions are to prevent their occurrence, or to be located at an appropriately safe distance.

Prevention of fire or explosion involves recognizing the hazard and taking appropriate actions. This includes utilization of equipment to detect a flammable or explosive atmosphere and utilizing equipment that will not ignite flammable gases, vapors, or other materials (for example, intrinsically safe instruments, non-sparking tools).

In areas where flammable materials are stored, handled, dispensed, transferred or used, smoking and the carrying of lighters, matches and other potentially spark producing equipment or devices will be prohibited. A spark generated by static electricity can have sufficient energy to ignite a flammable or explosive atmosphere. This may occur during the following: mixing or agitation of materials, during fluid transfers, or by friction of movement. Static electricity can be prevented during fluid transfers through proper bonding and grounding techniques.

Bonding is the linking of two containers with an electrical connection, usually a conducting wire equipped with conductive clamps. Grounding eliminates a difference in electrical potential between a given container and the earth. Grounding straps or wires must be connected to a known and verified ground source. It is important that clamps make a good metal to metal contact and are not blocked by a non-conductive material such as paint.

Portable fire extinguishers will be utilized at locations specified in the SSHSP and will be appropriate to the task. Portable fire extinguishers are classified by the National Fire Protection Association (NFPA) according to the type of burning materials they are designed to extinguish:

- ***Class A***-Ordinary combustibles such as wood, paper and textiles
- ***Class B***-Flammable liquids such as oil, grease and paint
- ***Class C***-Fires involving electrical equipment requiring non-conductive extinguishing media. This class is based on fire location and not burning media.
- ***Class D***-Combustible metals such as magnesium, sodium, zinc or powdered aluminum

The rating number on the fire extinguisher indicates its extinguishing potential. Class A designations are relative ratings (a 2-A has twice the extinguishing ability of a 1-A). Class B numeric designations represent the square footage of a deep-layer flammable liquid fire expected to be extinguished by an unskilled operator. Class C and D units are not given a numeric designation.

Remember to utilize the PASS system when operating portable fire extinguishers of any type: PULL the safety pin, AIM at the base of the fire, SQUEEZE the trigger and SWEEP the fire area. The number one concern is your safety! Always maintain a position between the fire and the nearest exit. If the fire continues to increase, exit the area immediately.

Combustibility and Flammability

Combustibility is the ability of a material to act as a fuel. Materials that can be ignited and sustain a fire are considered combustible, while those that do not are called non-combustible. Three elements are required for combustion to occur: fuel, oxygen and heat or an ignition source. The concentration of the fuel must be high enough to allow ignition and maintain the burning process. Heat is either supplied by the ignition source and is maintained by the combustion or supplied from an external source.

A material is labeled as flammable if it can be ignited easily and its flame produces enough to remain burning in normal conditions. The self-propagating flame is the dividing line between combustible and flammable solids. All combustible gases are considered flammable. A liquid is considered flammable if a flame will continue burning over a container of liquid that is at 1000° Fahrenheit (F). A flammable material is considered highly combustible if it is able to burn at ambient temperatures. Pyrophoric materials will ignite at room temperatures in the state of a gas or vapor when slight friction or shock occurs.

The flammable range of a material is the range of concentrations that is required for ignition and continued combustion. The flammable range is defined within two limits:

- ***Lower Flammable Limit (LFL) or Lower Explosive Limit (LEL)***-The lowest fuel to air concentration at which combustion can be sustained. Concentrations below the LFL or LEL are referred to as too “lean”.

- ***Upper Flammable Limit (UFL) or Upper Explosive Limit (UEL)***-The highest fuel to air concentration at which combustion can be sustained. Concentrations above the UFL or UEL are considered as too "rich".

Gas / Vapor Explosions

A gas or vapor explosion is a very rapid, violent release of energy. If combustion is extremely rapid, large amounts of energy, heat and gaseous products are released. The major factor contributing to the force of an explosion is the confinement of a flammable material. When vapors or gases cannot freely dissipate, they enter the combustion reaction more rapidly. Poorly ventilated buildings, sewers, drums, and bulk containers are examples of places that contain potentially explosive atmospheres.

Explosion Hazards

An explosive is a substance that undergoes a very rapid chemical transformation producing large amounts of gases and heat. The gases produced rapidly expand at velocities, which may exceed the speed of sound producing a shock wave (high-pressure front) and noise. Note that high or low explosive refers to the rate of chemical transformation, not the total force of the explosion:

- ***High or Detonating***-Chemical transformation occurs very rapidly with detonation rates as high as four miles per second. The rapidly expanding gas produces a shock wave followed by combustion.
- ***Primary High Explosive***-Detonating wave produced in an extremely short period of time. May be detonated by shock, heat or friction.
- ***Secondary High Explosive***-Generally requires an external trigger to detonate. Relatively insensitive to shock heat or friction.
- ***Low or Deflagrating***-Also known as very rapid burning, may have rate of deflagration up to 1,000 feet per second. Generally combustion followed by a shock wave.

Hazards Due to Toxicity

Toxic materials cause local or systemic detrimental effects to an organism. Exposure to such material does not always result in death. Toxic hazards are categorized by physiologic effects on an organism. A material may induce more than one physiologic response.

- ***Systemic Poisons***-Systemic poisons are chemical agents which act on specific target organs or organ systems. A subgroup includes anesthetics and narcotics. For site personnel, these agents represent particular dangers as they can impair judgement and thought processes. These agents depress the central nervous system, resulting in loss of sensation and stupor. In great enough concentrations, coma and/or death may occur.
- ***Asphyxiants***-Asphyxiants are agents which deprive tissues of oxygen. This group is divided into simple and chemical asphyxiants. Simple asphyxiants act by diluting or displacing atmospheric oxygen. Breathing air with oxygen concentrations less than

19.5% causes insufficient oxygen in blood and tissues. This may cause headaches, unconsciousness and eventually death (inert gases can be simple asphyxiants). Chemical asphyxiants prevent the uptake of oxygen in the blood or prevent the normal oxygen transfer from either blood to the tissues or within the cell itself.

- ***Irritants***-Irritants are materials that cause inflammation of tissues. The mechanism of irritation is by either corrosive or drying action and may affect the eyes, skin, respiratory membranes or gastrointestinal tract. The irritant must come in direct contact with the tissue to cause a reaction. Consequently, skin, eye and respiratory irritants are the greatest concern to site personnel.
- ***Sensitizers***-Sensitization to a chemical involves immune mechanisms. When a foreign substance, known as an antigen, enters body tissues the immune system triggers production of antibodies. If subsequent exposure causes antibody concentration to reach an allergic reaction, the body is sensitized. Skin and respiratory sensitizers may exhibit similar symptoms and can range from discomfort (such as poison ivy) to a fatal reaction (such as isocyanates).
- ***Carcinogens***-Carcinogens are materials known to cause cancer in laboratory test animals or humans. These materials are identified in the NIOSH guide with “Ca” indicated in the IDLH column.

Hazards Due to Corrosion

Corrosion is a process of material degradation. Upon contact, a corrosive material may destroy body tissues, metals, plastics or other materials. A corrosive agent is a reactive compound or element that produces a destructive chemical range in the material upon which it is acting. Common corrosives are the halogens, acids and bases. Skin irritation or burns may result when the body contacts an acidic or basic material.

The corrosiveness of acids and bases is proportional to their ability to dissociate (form ions) in solution. Those that form the greatest number of hydrogen ions (H+) are the strongest acids, while those that form the greatest number of (OH-) ions are the strongest bases. The H+ ion concentration scale is known as the pH scale. The pH scale ranges from 0 (strong acids) to 14 (strong bases) with a neutral pH of 7.

Hazards Due to Reactivity

A reactive material is one that can undergo a chemical reaction under certain conditions or in combination with other materials. Generally, the term “reactive hazard is used to refer to a substance that undergoes a violent or undesirable reaction in the presence of water or under normal atmospheric conditions. Among this type of hazard are the pyrophoric liquids which will ignite in air at or below normal room temperature in the absence of added heat, shock or friction, and the water reactive flammable solids which will spontaneously combust upon contact with water (such as potassium, sodium, lithium).

Electrical Hazards

Overhead power lines, downed electrical wires, and buried cables all pose a danger of shock or electrocution if workers contact them or sever them during site operations. Electrical equipment utilized on-site may also pose a hazard to workers. To minimize this hazard, low-voltage equipment with ground-fault interrupters and watertight corrosion resistant connecting cables will be utilized wherever possible. In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. To eliminate this particular hazard, weather conditions will be monitored and work suspended during electrical storms. Caution will also be utilized when dealing with capacitors or other equipment designed to retain a charge. All such items will be properly grounded before handling. OSHA standard 29 CFR 1920.137 describes PPE requirements for protection against electrical hazards.

Physical Hazards

The human body functions best at a certain internal temperature. When metabolism or external sources (fire, heat, PPE) cause the body temperature to rise, the body seeks to protect itself by triggering cooling mechanisms. The body dissipates excess heat by two means; changes in blood flow and perspiration. The major disorders due to heat stress are heat cramps, heat exhaustion and heat stroke.

- ***Heat Cramps***-Heat Cramps are painful spasms which occur in the skeletal muscles of workers who sweat profusely in the heat and drink large quantities of water, but fail to replace lost salts or electrolytes. Drinking water while continuing to lose salt tends to dilute the body's extra cellular fluids. Water eventually seeps into active muscles and causes pain. Muscles fatigued from work are usually most susceptible to cramps.
- ***Heat Exhaustion***-Heat Exhaustion is characterized by extreme weakness or fatigue, dizziness, nausea and headache. In serious cases, a person may vomit or lose consciousness. The skin is clammy and moist, complexion pale or flushed, and body temperature slightly higher than normal. Treatment consists of rest in a cool place and replacement of fluids. Mild cases may recover spontaneously with this treatment, severe cases may require hospital care.
- ***Heat Stroke***-Heat stroke is an extremely serious condition caused by the breakdown of the body's heat regulating mechanism. The skin is very dry and hot with a red, mottled or bluish appearance. Unconsciousness, mental confusion or convulsions may occur. Without quick and adequate treatment, the result may be death or permanent brain damage. Medical assistance is required immediately. As first aid, the person will be moved to a cool place. Body heat will be reduced artificially, but not too rapidly, by soaking the persons clothing with cool water.

Cold temperatures also create problems with the severe effects being frostbite and hypothermia. Frostbite is the most common injury from exposure to cold. The extremities of the body are most often affected. The signs of frostbite are: skin white or grayish yellow, pain early

and affected parts feel intensely cold and numb. Shivering, numbness, muscular weakness and low internal body temperature characterize hypothermia. This can lead to unconsciousness and death. With both frostbite and hypothermia, affected areas need to be warmed quickly. This is best accomplished through immersion in warm, not hot, water. In all cases seek medical assistance.

Noise stress and excessive acoustic energy can destroy the ability to hear and may also put stress on other parts of the body, including the heart. There is no cure for most effects of noise; therefore, prevention is the only way to avoid health effects. Damage from noise stress depends primarily on the intensity and length of exposure. The frequency or pitch can also have some effect, high-pitched sounds typically being more damaging than low pitched sounds. Normally, occupational exposure first affects the ability to hear high pitched sounds. Distortion may occur when there is significant background noise or many people talking. OSHA 29 CFR 1910.95 limits a workers noise exposure to 90 decibels A-weighted (TWA for an 8 hour exposure). The A-weighted scale is utilized to simulate human hearing.

Biological Hazards

Biological hazards that site personnel may encounter include animal bites, stings, contact with plants, or exposure to biological agents. Medical attention will be sought for any exposure to biological agents.

Job Hazard Analysis (JHA): JHAs can be used to formally identify, characterize and document H&S risks associated with work operations, materials, equipment and facilities. To aid in hazard documentation, a **JHA Form** (see Forms in the Appendix and down-loadable through H&S page of ARTIS.) The frequency of these analyses is based on the degree of hazard risk and nature of work operations;

H&S Standards/Regulations Review for New Projects: Plans for new or overhauled facilities, equipment, operations, construction or remediation projects, work permits, process and procedure changes, cleanup activities, etc., should be reviewed and analyzed to assure their compliance with applicable H&S standards and regulations;

Regular Inspections/Evaluations of Workplaces and Work Practices: Inspections/evaluations should be conducted on a routine basis by the Project Manager to ensure compliance with applicable standards. The effectiveness of exposure controls and hazard elimination/reduction applications should be verified;

Reprisal-Free Hazardous Condition Identification System: A reprisal-free system has been established for employees to notify their supervisors or management about hazardous conditions in their work environments. Employees are encouraged to initiate corrective action when and where appropriate;

Accident/Near Miss Investigations: Accidents should be investigated and documented on the **Incident Report Form** (and down-loadable through H&S page of ARTIS) to determine the root causes, identify *lessons learned* and develop actions needed to prevent future similar mishaps; and

Near Miss Reports: Near misses should be reported on the **Near Miss Form** (and down-loadable through H&S page of ARTIS) to identify *lessons learned* and develop actions needed to prevent future similar mishaps

Job-Related Injury/Illness Data Review: This data will be analyzed to identify patterns, unusual frequencies and hazard control system deficiencies.

HAZARD PREVENTION, CONTROL AND REGULATORY COMPLIANCE

Hazard prevention and control measures are generally triggered by a determination that a current or potential hazard exists. These conditions need to and can be anticipated or identified prior to the commencement of work activities. Where feasible, hazards can be circumscribed by effective design and/or modification of the job site characteristics or work procedures. If it is not practical to eliminate the hazards, then they can be mitigated by controls instituted to preclude unsafe and unhealthful exposures. Such control measures should be instituted in a timely manner once the problem has been identified.

The hazard reduction and control programs presented are not intended as stand-alone compliance programs. They do not fully address all of the requirements specified by each of the corresponding Federal regulations, but instead, the programs presented identify the key elements to meet project/work specific conditions or objectives.

SITE CHARACTERIZATION

Introduction

The first priority of any environmental team responding to a hazardous waste site or hazardous materials incident is to avoid increasing the number of people exposed to site hazards, or increasing the consequences of that exposure. The team must evaluate the degree of hazard presented by the site and collect information about:

- The substances involved
- Their behavior when released into various environmental media
- Their effects on public health, safety and the environment
- The location of the site or incident

The first activity at a hazardous site is called site characterization and analysis. During the site characterization and analysis tasks – preliminary off-site evaluation, site entry and air monitoring – all suspected conditions are identified that may pose inhalation or skin absorption hazards that are IDLH or that may cause death or serious harm. This includes exposures or potential exposures above the PEL, TLV or REL.

Based on the results of the site characterization and analysis, the appropriate level of PPE can be specified and utilized during subsequent site activities. The PPE provides protection to a level of exposure below published health effects limits for known or suspected hazardous substances and health hazards. The PPE specified is subject to modification, as more information becomes available. For unidentified substances or unknown conditions, the highest level of PPE will be utilized.

Preliminary Site Evaluation

Prior to commencement of work at any hazardous waste site, an evaluation of the potential hazards associated with the site must be undertaken. This evaluation consists of a summary of

available data of an actual investigation, depending on the quantity and quality of data available concerning existing site conditions. The following information will be collected in the preliminary evaluation:

- Location and the approximate size of the site
- Description of the response activity and or the tasks to be performed
- Duration or schedule of the planned activities
- Site topography
- Weather forecast for the region
- Site accessibility
- Pathways for hazardous substance dispersion
- Present status and capabilities of emergency response teams that would provide assistance to on-site personnel
- Hazardous substances and health hazards involved or expected at the site and their chemical and physical properties

If the preliminary site evaluation produces sufficient information to positively identify and quantify the hazards of the site, the appropriate level of PPE can be specified for site entry and all subsequent site activities. If the preliminary site evaluation does not produce sufficient information to positively identify and quantify the hazards or suspected hazards at the site, an initial site entry and characterization will be performed.

Initial Site Entry and Characterization

A survey team comprised of the SSC, team leader, and an experienced instrumentation specialist undertakes the initial characterization of the site. The survey team may monitor for the presence of oxygen, organic vapors, inorganic vapors, respirable dust, total ionizing radiation and oxygen deficient/rich or explosive atmospheres. This survey is conducted in accordance with an interim SSHSP based on available information.

If the preliminary site evaluation does not provide sufficient information to quantify the potential hazards of the site, Level B PPE shall be provided as a minimum protection during entry. The survey team prepares for site entry at a staging area located upwind of the site which is judged to represent a clean area or “background” conditions. This location is utilized for instrument calibration, gathering background readings, donning PPE and preparing for the survey.

Hazard Monitoring Protocols

The site entry and characterization will provide information on all potentially hazardous conditions. Direct reading instruments (DRIs) for the detection of organic and inorganic vapors and gases will be utilized on every site. Other DRIs may be utilized for the detection of respirable dusts or specific compounds of concern. Monitoring to be performed during site entry includes, but is not limited to, the following:

- Oxygen measurements are of particular importance for work in confined spaces, low-lying areas, or in the vicinity of accidents that may have released vapors
- LEL measurements to determine the presence of explosive atmospheres especially in areas where gases can concentrate
- Organic and inorganic vapor concentrations may be measured utilizing flame ionization detectors (FID) or photo-ionization detectors (PID)
- If specific inorganic contaminants are known or suspected to be present, measurements will be made with appropriate test methods
- The initial site characterization will include a determination of aerosol concentration whenever on-site conditions are visibly dusty
- Radiation monitoring will be performed unless radioactive materials are known to be absent.

The site characterization will also incorporate an evaluation of potential exposures to biological and noise hazards.

Air Monitoring Instruments

During the site entry, quantitative data are needed concerning air contaminants and any changes that may occur in composition and/or concentration. The determination of explosive and/or oxygen deficient or rich atmospheres is accomplished utilizing a combination explosivity/oxygen meter. Monitoring for vapors, gases, fume and particulates is accomplished utilizing DRIs such as FID, PID, respirable dust monitor or air sampling pumps. Note that DRIs are useful for establishing total concentrations. If specific organic compounds have to be identified, DRIs calibrated to those specific materials may be used for analysis. In many instances, only appropriate sampling techniques and subsequent laboratory analysis can be used for the positive and quantitative identification of specific contaminants.

Site Characterization Results

Based on results of the monitoring data obtained during the site characterization and analysis, an evaluation of the site specific characteristics and associated health hazards is performed to aid in the selection of appropriate engineering controls and PPE to be utilized in performing site activities.

Sufficient data will be obtained during the initial site characterization to determine levels of protection, establish site work zones and select candidate areas for more thorough qualitative and quantitative studies. However, monitoring instruments will not be the sole criteria for determining levels of protection since these instruments have limitations and vary in relative sensitivity to different chemicals/compounds. Additional criteria that will be utilized in determining levels of protection and health and safety issues for a particular site include, but are not limited to, the following:

- Site history, especially waste disposal records

- Potential for rapid increases in contaminant concentrations (pressurized vessels, storage tanks, etc.)
- Visual observations such as stained or discolored soils, dusty conditions, etc.
- Presence or conspicuous absence of free standing liquids
- Particular odors

Once the presence and concentrations of specific hazardous substances and health hazards are established, the risks associated with these materials are identified. Employees who will be working on the site must be informed of all identified risks.

Continuing Site Characterization

While initial site characterization and analysis provide valuable data concerning ambient air contaminants, subsequent site activities, especially intrusive ones, often free contaminants to the air. For example, intrusive activities such as well drilling and test pit excavation can release both volatile organic compounds and particulate contaminants.

Once site characterization and analysis have determined that the site is safe for the startup of activities (with appropriate SSHSP, engineering controls and PPE), an ongoing air-monitoring program will be implemented. At a minimum, periodic monitoring will be conducted when:

- Work begins on a different portion of the site
- New contaminants are identified
- Intrusive activities are being conducted
- New work tasks are initiated

The ongoing air-monitoring program is developed based on the results of site characterization and the types of activities to be performed. The ongoing air-monitoring program may utilize any sampling protocol required to obtain the required data. To verify that site control procedures prevent the spread of contamination, the support zone, contamination reduction zone and exclusion zone will be periodically monitored for the contaminants of concern.

Atmosphere Testing/Conditioning for Excavations, Well Installations, and Soil Borings

The following procedures are designed to address the atmosphere testing/conditioning procedures necessary for excavations, well installations, or soil borings which involve release of flammable and/or toxic gases.

1) If gas or vapor venting occurs from a soil boring, well installation, excavation, or other source, immediately position upwind from the source. If necessary, use respiratory protection as discussed below. If the odor of natural gas is detected or if it is suspected that a pipeline has been hit, immediately stop work, evacuate the area, and contact the proper authorities.
2) Always keep the following points in mind when soil venting or other release of gas or vapor occurs:

- Never work in an area which is above the combustible gas lower explosive limit (LEL) or above the hydrogen sulfide warning limit, as discussed below; and
- Never continue to work in an area – even if LEL and hydrogen sulfide tests are acceptable – if you begin to notice strange odors or symptoms of overexposure (such as dizziness, nausea, tearing of the eyes, etc.). If this occurs, always stop work and evacuate the area pending further evaluation.

3) If natural gas or other pipeline material is not involved and the venting continues, stop work and perform appropriate testing using a combustible gas/hydrogen sulfide gas monitor (e.g., MSA 361 or equivalent). Proceed as follows:
   - If testing indicates no hazard, resume work and continue periodic testing.
   - If testing indicates combustible gases present below 20 percent of the LEL, verify the absence of hydrogen sulfide and resume work with continued monitoring. If vapors are detected in the work area, use fans or other means to disperse as appropriate. Consult with the Health and Safety Manager to determine whether other types of testing may be required to verify that exposure levels are within acceptable limits. Use respiratory protection as necessary, based on testing results and other site-specific information.
   - If testing indicates combustible gases present above 20 percent of the LEL, assume that an explosion hazard exists. Do not resume work until testing shows the hazard has been removed. In some cases, this may be accomplished by allowing the gas to dissipate by natural or fan-forced ventilation. It may also be necessary or useful to inert a well or boring by introducing nitrogen or carbon dioxide through a non-conductive line. Water or drilling mud may be used to replace air in some bore holes and thereby eliminate the explosion risk. Verify the absence of hydrogen sulfide and resume work only when testing shows the explosion hazard has been removed. Continue to test on a regular basis to ensure that the atmosphere remains inert.
   - If testing indicates the presence of hydrogen sulfide, apply the same ventilation or inerting procedures as described above. Do not work in areas where the hydrogen sulfide concentration is above the applicable exposure level without appropriate respiratory protection. Resume work only when testing shows that the exposure level is within acceptable limits. Continue to monitor on a regular basis to ensure that the atmosphere remains safe.

HEALTH AND SAFETY TRAINING

Employees need to be made aware of potentially hazardous conditions and trained in associated hazard prevention/avoidance skills. Supervisors/managers are encouraged to keep up with their certificates and training in order to identify and abate hazards within their areas of responsibility, and foster and maintain a safe and healthy working environment.

All organizational levels should receive training in applicable H&S policies and responsibilities as specified in the H&S Manual and in any project-specific safe work practices or procedures.

Based upon this objective, Apex personnel responsible for H&S support and oversight activities should become familiar with the procedures outlined in this H&S Manual. They should also have a clear understanding of the objectives of each individual program so that their activities are based on sound scientific judgment and applicable regulatory requirements.

References

OSHA's website: *http://www.osha.gov*

3.0 APEX H&S POLICY AND MANAGEMENT COMMITMENT

It is Apex's policy to provide a safe and healthful work environment for its employees, clients, subcontractors and work area visitors, as well as to conduct operations in an efficient and cost-effective manner. It is also Apex's policy to operate in accordance with applicable H&S regulations, standards and requirements, as specified herein.

The basic principles of Apex's H&S policy and commitment to effective management can be summarized as follows:

- Occupational injuries and illnesses are preventable.
- Safety is everyone's responsibility.
- Working safely is a condition of employment.

By adhering to and following these H&S principles, we can:

- Eliminate undue risk to people and the environment. and
- Comply with all applicable safety, health and environmental requirements.

Apex is committed to identifying, evaluating and controlling workplace hazards for the protection of its employees. Hazards and necessary controls will be effectively communicated to affected personnel as needed. When feasible, engineering controls to mitigate hazards will be

established preferentially to administrative or personal protective equipment (PPE) controls. Exposures to hazardous substances and conditions will be maintained within regulatory standards, and efforts to minimize any exposures well below those standards will be taken, as reasonably feasible. Consistent efforts will also be made to minimize Apex employees' exposure to imminent danger hazards. Effective orientation and training will be provided to affected personnel to assist with their ability to work safely and confidently.

References

No references for this section.

4.0 SCOPE AND APPLICABILITY

The H&S Manual applies to all project design, management, monitoring and related support services connected with work activities.

References

No references for this section.

5.0 INTERFACE WITH PROJECT OPERATION RULES

The purpose of this section is to define the relationship between the procedures and program elements set forth in both the H&S Manual and the H&S requirements set by Apex clients.

CLIENT-APEX H&S RULE INTERFACE

The procedures and program elements described in the H&S Manual provide the operational details for Apex to achieve safe and healthful work operations. These procedures and program elements are also designed to meet and be compatible with clients' (host employers') own specific H&S policies and programs. However, if differences in requirements should arise, Apex personnel will follow the more conservative and protective of the applicable programs. Apex personnel will complete any additional worksite-specific safety training and observe applicable work area protection requirements specified by our clients.

References

No references for this section.

6.0 HEALTH AND SAFETY REQUIREMENTS

PURPOSE

- To describe how the Apex H&S Program ties into project planning and initiation; and
- To notify Apex employees of the federal, state and client-specific H&S standards that they should follow during work activities.

REQUIREMENTS

H&S issues are a critical part of all fieldwork activities. Depending on the size of the project, program and project managers may contact an H&S specialist early in the planning process, who will plan and oversee each activity involving potentially hazardous work activities. If the project size and scope does not warrant an H&S specialist, the Project Manager will fulfill this role. This process will provide field personnel with information concerning hazards and contaminants to which they may be exposed, safety equipment required, and necessary safety practices. OSHA regulations [29 Code of Federal Regulations (CFR), Parts 1910 and 1926], U.S. Environmental Protection Agency (EPA) regulations (40 CFR), Apex employee handbook guidelines, client-specific operation rules (as appropriate), and applicable state standards should be followed.

Other references which may be useful for completing Health and Safety Plans and making decisions in the field concerning the recognition, evaluation and control of potential hazards and safety equipment use are included in the following references:

- ANSI guidance documents;
- ACGIH Threshold Limit Values (TLVs) and BEIs;
- OSHA draft or proposed rules and guidelines;
- NIOSH recommended exposure limits;
- NFPA standards and recommended practices;
- USACE Safety and Health Requirements Manual, EM-385 1-1;
- Apex H&S forms (see Forms Appendix) and programs as well as other information found in Apex's Employee Handbook;
- NIOSH pocket guide to chemical hazards;
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities by NIOSH/OSHA/USCG/EPA, October 1985 or most recent revision; and
- DOT Emergency Response Guidebook.

References

See above references.

7.0 H&S PROGRAM ROLES AND RESPONSIBILITIES

The purpose of this section is:

- To inform Apex management of the need for their commitment to the H&S Program;
- To outline the roles and responsibilities of management and staff with respect to the H&S Program; and
- To define the level of H&S Program participation that Apex subcontractors should attain.

PERSONNEL RESPONSIBILITIES

Apex management is committed to the H&S Program. The specific roles and responsibilities for Apex management and staff are flexible, somewhat dependent on project size and scope and outlined in the following sections. Not every listed position will be part of each Apex project; where applicable, the following are general guidelines to be followed by role.

Division Managers

- Assign an Office Safety Coordinator and ensure they have time to complete their responsibilities.
- Review staff safety performance and hold team accountable to established H&S guidelines.
- Communicate Health and Safety policy and responsibility to staff.
- Ensure staff compliance with training requirements.
- Ensure that tasks such as preparation of the HASP, workplace analysis, daily tailgate meetings and proper PPE usage are completed as required on each project.

Program Managers

- Ensure that each project has adequate direction, management and resources to achieve its H&S goals and objectives;
- Develop and implement systems to ensure that employees follow H&S Program guidelines;
- Designate an adequate number of staff with the necessary authority and responsibility to implement the H&S Program objectives and to verify its effectiveness;
- Working with the Apex HR department, use progressive corrective action, where necessary, to achieve continuous H&S performance improvement;
- Ensure employee awareness of and involvement in H&S initiatives;
- Assign and communicate H&S responsibility to assigned staff; and
- Hold assigned staff accountable for their performance.

> Managers should encourage employees to offer H&S improvement suggestions and concerns, and employ the suggestions or address the identified concerns.

Project Managers

- Ensure that all client assigned project/task specific work is properly prioritized and planned and that a Health and Safety Plan is developed and implemented prior to starting work;
- Ensure that assigned personnel (including new employees) possess the training, skills and resources necessary to conduct and execute their work operations in a safe manner; and
- Provide periodic H&S Program reviews to ensure program effectiveness and quality.

H&S Specialists (project specific – may be performed by Project Manager)

- Provide H&S technical expertise necessary to carry out requirements and support work activities;

- Actively implement and enforce the applicable H&S Program requirements, with project personnel assigned to work within their jurisdiction;
- Disseminate information contained in the H&S Policy Manual, the H&S Program Manual, and HASPs, including safety and health related training;
- Develop and review JHAs for site tasks;
- Ensure that adequate safety controls (as defined by the H&S Programs and Training Manual, applicable project specification documents and the most current H&S regulations) are maintained;
- Ensure that appropriate H&S documentation is maintained for projects under their supervision;
- Conduct exposure monitoring;
- Gather related information about suspect hazardous materials to facilitate preparation of hazardous material abatement operations; and
- Investigate all accidents and near misses to determine root cause and implement corrective action necessary to abate the hazard.

Office Health and Safety Coordinator

- Take an active role in Corporate Safety Committee activities including conference calls, disseminating safety alerts, location chemical inventory and MSDA maintenance, and point of contact for safety issues.

Employees

- Conduct their assigned work in a safe manner, in accordance with the requirements of the H&S Programs Manual and HASP, other applicable safe work procedures and controls specified in permits such as a confined space entry permit or a hot work permit;
- Use assigned personal protective equipment (PPE) in the appropriate manner;
- Observe their work area surroundings for potential safety issues;
- Report any observed unsafe conditions or practices to the Project Manager;
- Initiate (when feasible) personal action to correct or mitigate an unsafe condition;
- Participate in necessary training to assist in awareness and qualify to work effectively, safely and in compliance with relevant environmental regulations; and
- Report any injuries or near misses and participate in the investigation thereof.

Site Visitors

- Adhere to the safety practices and level of protection designated by the Project Manager or the project H&S Specialist, and remains outside designated work areas.

Apex Subcontractors

- Apex designated subcontractor employees should participate in H&S functions and activities such as routine tailgate safety meetings, safety committees and safety walkthroughs as directed by Project Manager.

References

No references for this section.

8.0 H&S DOCUMENT CONTROL AND RECORDS MANAGEMENT

The H&S Manual and the records generated by the implementation of all Apex H&S programs must be controlled and properly managed.

The H&S Manual is a controlled document. Apex manages and tracks the distribution, revision and return of controlled copies of the document.

Records generated by the Apex H&S programs are stored and maintained as documentation of development, implementation, review and continual improvement of the program. In some instances, H&S Program records must be submitted to regulatory agencies or kept on for a defined period of retention.

This Section applies to all Apex H&S Programs controlled documents and records.

DOCUMENT CONTROL SYSTEM

Apex maintains a document control system for specific H&S documents.

General Documentation Requirements

Apex maintains an organized H&S Program. Documentation is the primary means of demonstrating the effectiveness of the entire program.

The H&S Program utilizes a tiered documentation system as follows:

- Tier 1 is the Apex H&S Manual and other Corporate-wide H&S documents, which provides a general overview of the H&S Program.
- Tier 2 consists of the various procedures which provide details regarding a specific element, process or operation. Project HASPs are examples of a Tier 2 document.
- Tier 3 consists of work instructions, training documents, etc. which are typically focused on task specific elements.
- Tier 4 consists of H&S forms and records generated throughout the H&S Program. Uncompleted forms like inspection checklists are examples of Tier 4 documents. Completed Incident Reports, Tailgate Safety Meeting Forms and completed Field Logbooks are examples of Tier 4 records.

TABLE 8-1 H&S CONTROLLED DOCUMENTS/RECORDS AND OWNERS

CONTROLLED DOCUMENT	APEX DOCUMENT OWNER
Apex H&S Manual	Corporate H&S Manager
Health and Safety Policy	Corporate H&S Manager
Health and Safety Plan	Project Manager
Site Security Plan	Project Manager
Tailgate Safety Meeting Records	Project Manager
H&S inspection records	Project Manager or Competent/Qualified Designee
JHA	Project Manager
Drug Free Workplace Policy	Manager of Human Resources
Violence Prevention Policy	Manager of Human Resources
Work Rules	Manager of Human Resources
Medical and Exposure Records	Manager of Human Resources
Training Records	Manager of Human Resources

Responsibilities

Controlled documents are assigned to Document Owners.

The Document Owner shall control distribution, revision, and disposition of documents for which they are responsible.

Apex personnel are responsible for maintaining their copies of controlled documents, including insertion of any revised information, and for returning their copies of controlled documents upon separation from the company.

Document Control Requirements

Corporate Controlled Documents

Approved corporate documents shall be controlled and distributed by inclusion in the Corporate Library on the Apex network server.

Electronic controlled documents are accessible by password. The electronic controlled documents should not be printed by the user. Self-printed versions of the document are uncontrolled and the user will be responsible for verifying the current version on the network before use. The electronic version is an Adobe file, and revisions and updates will be made available on the network. The Document Owner is responsible for uploading the corporate controlled document.

If hard copies are necessary for a corporate controlled document they should be requested from the Document Owner. The Document Owner shall prepare a list of individuals who, based on assigned responsibilities or relationship with Apex, are designated to be on controlled distribution for hard copies. The Document Owner will retain the controlled document list in the project files as an H&S record.

Project Controlled Documents

Approved project specific documents shall be controlled by the project Document Owner who shall prepare a list of individuals who, based on assigned responsibilities or relationship with Apex, are designated to be on controlled distribution for hard copies. The assigned Document Owner shall be responsible for maintaining the currency of the controlled document list and for controlled distribution of the document. The Document Owner will retain the controlled document list in the project files as an H&S record.

Document Review and Approval and Use

Controlled documents are reviewed and approved by authorized personnel prior to use.

Drafts of documents shall be designated by date of approval.

The current versions of controlled documents are available at all locations where they are essential for the effective functioning of the H&S Program. All documents stored on computer systems shall be changed, accessed, and protected by the use of login passwords and restricted access privileges.

CONTROLLED H&S DOCUMENT REVIEW AND REVISIONS

Document Review

Tier 1 controlled documents are reviewed on an annual basis, at a minimum.

If revisions are required, the document may be revised in part or in whole based upon the extent of revised material.

Tier 2, 3 and 4 controlled documents are reviewed and revised based upon identified need. For example, revisions to JHAs based upon activity review, revisions to SSHPs due to new work scope, etc. At a minimum, Tier 2, 3, and 4 documents should be reviewed and identified revisions made as part of an Incident/Near Miss Review process.

Document Revisions and Removal of Obsolete Documents

Revisions to controlled documents shall be prepared, reviewed, approved and issued in the same manner as the original document

The Document Owner is responsible for managing the review and re-approval process. All subsequent revisions to approved controlled documents will have the date of revision.

Revisions to Tier 1 controlled documents shall be designated for inclusion into the Corporate Library on the network server. The revision date shall be marked on each document.

Revisions to Tier 2, 3 and 4 documents shall be prepared, reviewed, approved and issued in the same manner as the original document. Revisions shall be identified by the use of subsequent revision numbers. The revision date shall be marked on each document.

An errata to an approved and issued controlled document of any Tier may be issued by the Document Owner without any formal review and comment as long as the changes are editorial in nature. Corrections shall be incorporated in the next revision to the controlled document.

All obsolete controlled documents shall be labeled “obsolete” or “superseded to preclude inadvertent use” or shall be destroyed. Electronic versions of obsolete controlled documents shall be removed from the Corporate Library and archived to a restricted network location.

As controlled documents are revised, the Document Owner or designee will distribute the revisions and update their controlled document list to show the revision distribution.

RECORDS MANAGEMENT

The H&S records are identified, collected, indexed, accessed, filed and maintained in a manner suitable to demonstrate compliance with specified requirements and effectiveness of the quality system operation. The Corporate H&S Manager, working with HR, maintains Corporate H&S records in corporate files. Project-specific H&S records are maintained by the Project Manager in the project files.

Where client or regulatory-required retention times are specified, the longer of the retention times will be applied to project H&S records.

H&S records are provided to clients and regulatory agencies when required by external audits.

All H&S records shall be maintained in a manner to ensure the following:

- H&S records are legible and identifiable to the program or project;
- H&S records are readily retrievable and stored in a secure area to prevent damage, deterioration, or loss; and
- H&S records shall be kept for a period of minimum of three years and disposed of after proper authorization.

9.0 OCCUPATIONAL HEALTH PROGRAMS

RESPIRATORY PROTECTION PROGRAM

Scope of the Program

Apex anticipates the need for employees to utilize respirators for protection from a variety of hazardous airborne contaminants. Such exposures may result from activities taking place in any area where hazardous substances have the potential to become airborne, either through a chemical, biological or physical activity.

All Apex employees that may need to wear a respirator will be trained prior to requiring the employee to use the respirator; and at least retrained on an annual basis. The training will address the knowledge of respirators, fit, use, limitations, emergency situations, wearing, fit

checks, maintenance and storage, medical signs and symptoms of effective use, and the general requirements of the OSHA Standard.

All respirators, training and medical evaluations are provided at no cost to the employee.

The type of respirator worn most often by Apex personnel will be a tight-fitting, half or full face-piece respirator, or battery powered air-purifying respirator (PAPR) designed to remove asbestos fibers, particulates, fumes, mists, organic vapors or gases. Apex's Respiratory Protection Program (RPP) focuses on the use of these types of respirators. If an Apex employee is required to work in an Immediately Dangerous to Life or Health (IDLH) atmosphere, and/or wear a self-contained breathing apparatus (SCBA) or supplied air respirator (SAR), he/she will have additional job-specific training in the use of these types of respiratory protection, prior to wearing the respirator.

OSHA requires that respirators will be provided to employees by the employer and should be worn in the following situations:

- When engineering controls, work practices or administrative controls are not feasible for assuring safe and healthful conditions;
- While engineering controls are in the process of being instituted;
- Where protection against occasional and/or relatively brief exposure is needed;
- When the oxygen concentration in the air is insufficient to support life (less than 19.5%), or when entering a confined space or any other area with unknown concentrations of air contaminants; and
- When required by applicable laws and regulations.

Apex requires respiratory protection for personnel working in areas which have potential for exposure to excessive levels of microbiological contaminants. For example, microbiological contaminants might be encountered during indoor air quality investigations in situations where mold or other microbial growth is obvious on the building structures and inside heating and air conditioning systems. Certain microbiological organisms have been associated with severe respiratory illnesses (e.g., Histoplasmosis, a lung disease caused by the decay of bird and bat droppings). These types of contaminants generally do not have established exposure limits. Apex employees may encounter the need for wearing respiratory protection in areas inside a building, in confined spaces or crawl spaces, which show water intrusion, staining, musty odors or obvious microbial growth, or areas where bird or bat droppings may be encountered. Apex also requires that its employees bring respiratory protection to job sites for use in emergency situations, even though respiratory protection may not be required for the services being provided to our clients. Emergency situations may develop during soil or tank excavation or other activities, which produce atmospheric contamination due to the accidental rupturing of a tank, drum, gas line, excavation into contaminated soils, etc.

Regulatory Authority and Program Guidance

OSHA regulations mandate that employers instituting the use of respirators should comply with certain standards.

OSHA has created other standards specific to certain contaminants that require use of respirators (e.g., arsenic, benzene, tuberculosis). To obtain the most current versions of these standards and other related standards refer to OSHA's website.

In addition to OSHA, Apex's RPP should comply with the most recent revision of relevant ANSI, NIOSH, and AR guidelines (see References).

It is the policy of Apex to comply with all applicable federal and state requirements, whether or not specifically referenced in this RPP.

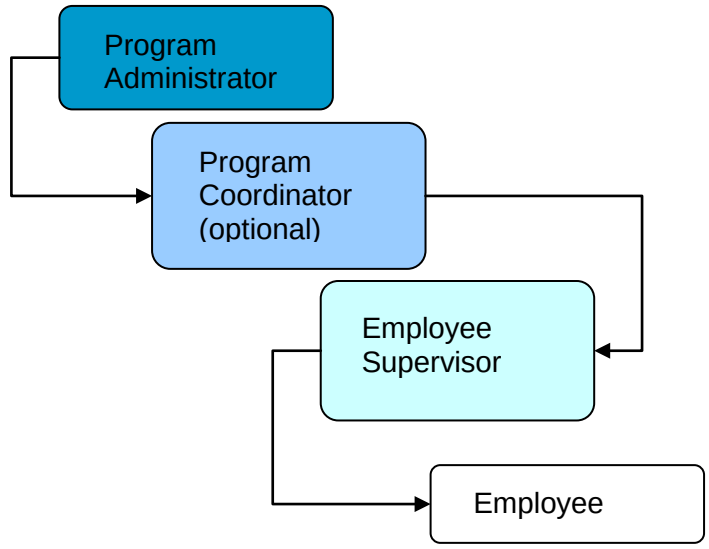
Program Requirements

The key requirements of an acceptable respiratory protection program are set forth in the most current revision of OSHA's Respiratory Protection Standard and are summarized below:

- The program should be in writing;
- Written standard operating procedures should be established for the safe and proper use of respirators;
- A medical surveillance program (employee physicals) should be established;
- Selection of respiratory protection should be based on the hazards to which an employee is exposed. Only NIOSH-certified respirators should be used;
- Training covering the proper use and limitations of respirators should be offered;
- Provisions should be established for the regular cleaning and disinfecting of all respirators. Respirators should be inspected during cleaning. Worn or deteriorated parts should be replaced by a competent person;
- Respirators will be assigned to individual workers for their exclusive use;
- Fit-testing should be performed at least annually;
- A monitoring program for the evaluation and documentation of work area conditions should be established and relate actual personal exposure to appropriate respiratory protection (usually established in a SSHP); and
- The respiratory protection program should be evaluated for effectiveness on an annual basis.

Program Personnel

The RPP has up to three levels of management who supervise the implementation of the RPP for Apex's employees. The Figure below depicts the chain of command for the RPP.



The Respiratory Protection Program personnel chain of command

The responsibilities of each level of management as well as Apex's employees are described below.

Program Administrator Responsibilities

Apex has designated the Manager, Corporate Health & Safety, to be program administrator. In addition, each location or region will designate a program coordinator for every location or region that has employees that may be required to wear respirators. The RPP Administrator will, with the support of other Apex personnel, administer all aspects of the program and maintain required documentation.

The Program Administrator is responsible for ensuring the following:

Administration of the respiratory protection program is properly carried out;

- Appropriate medical surveillance of each employee issued a respirator occurs;
- Appropriate respirators are issued and maintained;
- Selecting proper respirators based on the nature of the specific hazard and conditions of use;
- Qualitative fit testing or quantitative fit testing is performed at least annually for tight-fitting respirators;
- Training is provided annually in the use, care, cleaning, storage and limitations of respirators and allows employees the opportunity to become accustomed to, and gain confidence in, the use of respirators while in a safe environment;

- All necessary records and documentation for the RPP are maintained;
- That all employees who voluntarily wear a respirator obtain the same training as the employees required to wear respirators and conduct training on an annual basis; and
- Ensure that the effectiveness of the RPP is evaluated on an annual basis, updating it as necessary to assure continued safety of employees and compliance with the OSHA Respiratory Protection Standards.

Employee Responsibilities

Apex employees performing tasks for which respirators are required should:

- Be clean shaven in the area of the respirator face-piece to face seal;
- Inspect his/her respirator before and after each use. Replace, or have replaced, worn or damaged parts, as needed;
- Clean his/her respirator after each use and ensure that it is properly stored in a plastic bag or other suitable clean container;
- Perform required positive/negative pressure fit checks prior to each use;
- Utilize the respirator properly during designated tasks;
- Routinely replace respirator cartridges according to established change out schedules and when breakthrough is noted. Obtain proper cartridge replacements;
- Be familiar with the SSHP and requirements for respiratory protection for projects being worked on and be familiar with the known or potential contaminants expected at the job site and associated hazards;
- Be familiar with their respirator's product information particularly regarding selection, use, maintenance and care; and
- Be trained on an annual basis on the requirements of the OSHA Respirator Standard and on the contents and requirements of the Apex RPP.
- Respirators must be stored so that they have protection from damage, contamination, etc.
- When respirators are for emergency use, they must be stored accessibly and clearly marked.
- The area where the face piece seals to the face must be kept clean and free from defects.
- Employee must leave the respirator area to wash, change cartridges, or if they detect break-through or resistance.

Supervisor Responsibilities

Supervisors of employees performing tasks for which respirators are assigned should:

- Prohibit any worker from working in a contaminated, or potentially contaminated, atmosphere if the worker is not clean shaven or does not pass user fit-checks on the respirator;
- Ensure that employees utilize the proper cartridge or filter for the contaminants of concern;
- Ensure that workers inspect their respirators adequately before and after use and perform positive and negative pressure fit checks prior to each use;
- Ensure that cleaning facilities are provided and utilized;
- Require proper use of respirators during designated tasks;
- Periodically inspect storage of respirators to make certain respirators are stored in a plastic bag or other suitable storage container in an uncontaminated atmosphere and in a proper manner;
- Ensure that workers have had appropriate training and are medically qualified to wear respirators prior to employees using a respirator.
- The employer is required to identify all potential job hazards prior to commencing work on projects that require, or may require the use of respiratory protection and if unable to engineer out the hazards, then they must select and provide respirators based on the hazards and factors affecting performance. This review should be documented and signed.
- Conduct period project safety audits, when appropriate, to verify that respirators and other personal protective equipment are being appropriately used, and verify that the requirements of the Respiratory Protection Plan are being followed; and
- Receive the same training as employees who may be wearing respiratory protection.

Program Coordinator Responsibilities

The Program Coordinator will be responsible for:

- Maintaining respirator fit test and other respiratory protection records of office employees;
- Coordinating medical exams for respirator users;
- Maintaining files on medical approvals for respirator users; and,
- Providing general oversight of the RPP for the office.

Respirator Selection

As required by OSHA, only NIOSH-approved respirators and replacement parts will be purchased at no cost to the employee for use for Apex employees. If for some reason an employee is unable to wear a certain type or brand of respirator, a different respirator may be chosen by the employee, providing it is

Respirators will be chosen on the basis of:

- The type of hazard the employees are exposed to, e.g. gas, vapors, dust, or fumes;
- The concentration of the hazard in the air; and
- The protection factor of the respirator (Protection factors (PF) are assigned to respirators by NIOSH).

NIOSH-approved. By regulation, Apex may provide a PAPR in lieu of any negative-pressure respirator whenever an employee chooses to use this type of respirator.

The table below provides guidance on the types of respirators that could be used with various air contaminants and respirators associated with typical consulting services that Apex provides.

TASKS REQUIRING RESPIRATORY PROTECTION

TASK	MINIMUM RESPIRATORY PROTECTION
Working in any asbestos, lead or other "regulated area"	Half-face piece, negative pressure respirator with P-100 cartridges
When bulk sampling suspect asbestos-containing materials	Half-face piece, negative pressure respirator with P-100 cartridges
Working around fumes, oil mist or dusts containing heavy metals or sampling for bacteria or fungi in buildings known to have water damage and indoor air quality problems	Half-face piece, negative pressure respirator with P-100 cartridges
Working around fuel oil, gasoline or PAH contaminated soils	Half-face piece, negative pressure respirator with P-100 and organic vapor cartridges
In an oxygen deficient atmosphere (less than 19.5%)	Positive pressure, SCBA or supplied-air, full-face piece respirator, with escape SCBA.
Working around particulate projectiles or suspended particulates	Full-face piece, negative pressure respirator with P-100 cartridges
Working in areas that contain gaseous or vapor contaminants	Full-face piece, PAPR or full-face negative pressure respirator with organic vapor or other appropriate chemical cartridges
Working at an uncharacterized hazardous waste site	SCBA; full-face, negative pressure, respirator with organic vapor or other appropriate chemical cartridges, if approved by project EHS specialist.
NOTE: The adequacy of respiratory protection utilized will be assessed for each application and modified as conditions warrant.	
NOTE: The PAPR and negative pressure respirators listed above cannot be used in IDLH environments. Such environments require the use of full face piece pressure demand SCBA or combination full face piece SAR with auxiliary self-contained air supply.	

The protection factor of a respirator is multiplied by the current OSHA Permissible Exposure Limit (PEL) of the contaminant to determine the maximum concentration of contaminant in air acceptable for a respirator. At the time of this manual's creation, OSHA was reviewing assigned protection factors and maximum use concentrations (MUC) permitted for various respirators.

PAPRs and Negative Pressure Respirators

Negative pressure respirators and PAPRs consist of a face-piece and an air-purifying device, which is either a removable component of the face-piece, or an air-purifying apparatus worn on a body harness and attached to the face-piece by a hose. These respirators selectively remove specific airborne contaminants from ambient air by filtration, absorption, adsorption or chemical reactions. They are approved for use in atmospheres containing specific contaminants up to designated concentrations and NOT for IDLH atmospheres.

The primary benefits of utilizing air-purifying respirators include enhanced mobility of the wearer and relatively low cost. The limitations of air-purifying respirators include:

- Cannot be used in IDLH or oxygen-deficient atmospheres (less than 19.5% oxygen);
- Limited duration of protection;
- Only protects against specific chemicals and concentrations; and
- Requires monitoring of air contaminants and oxygen levels.

When Apex personnel wear respirators in atmospheres that are not IDLH, Apex will provide a NIOSH-approved respirator that is adequate to protect the health of the employees. For protection against gases and vapors, Apex will provide a respirator, provided that the respirator cartridge is equipped with an End-of-Service-Life Indicator (ESLI) certified by NIOSH for the contaminant. If there is no ESLI appropriate for conditions in the employee's workplace, Apex will implement a change-out schedule for canisters and cartridges that is based on objective information or data, including air monitoring data that will ensure that canisters and cartridges are changed before the end of their service life. Apex will rely upon the respirator manufacturer's recommendations and atmospheric concentrations at the job site in establishing a cartridge Change-Out Schedule.

> When no ESLI is available for a gas or vapor, employees should change filters or cartridges at least once every eight-hours for exposure to atmospheric concentrations at, or below, two times the OSHA PEL of the contaminant.

When the gas or vapor is a carcinogen, Apex personnel are not permitted to wear any respirator unless concentrations are being monitored continuously and concentrations are determined to be below any established OSHA Permissible Exposure Limit (PEL). (Note that there are not many carcinogens with established PELs). Otherwise, supplied air respirators will be worn when working in atmospheres containing carcinogens.

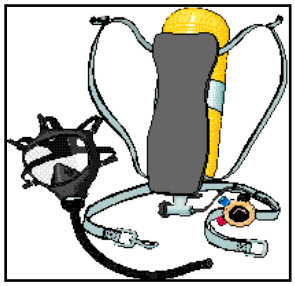
For protection against particulate concentrations that are not considered IDLH, Apex will provide:

- A respirator equipped with a filter certified by NIOSH under 30 CFR Part 11, as a high efficiency particulate air (HEPA) filter, or an respirator equipped with a filter certified for particulates by NIOSH under 42 CFR Part 84; or

- A PAPR.

Supplied Air Respirators

SARs include airline (Type C) respirators and SCBAs. SARs are utilized when PAPRs and negative pressure respirators cannot adequately control exposure to respiratory hazards. Selection will be performed according to the guidance of the latest revision of ANSI Standard Z88.2.



If SARs or SCBAs are utilized, air must be Grade D or better. The compressor must be located in a "clean" atmosphere, with in-line purification and tagged to indicate date or change-out. A carbon monoxide (CO) monitor must be used near the input and set to alarm at 10 PPM or monitored frequently. All fittings must be incompatible for non-respirable gases and containers.

If SARs are used, emergency respirators must be used.

Eye Protection and Respirator Use

Wherever eye protection (goggles or safety glasses) is required and an employee should wear eyeglasses, the fit of the respirator should not be compromised. Half-face piece respirator straps should go underneath glasses or goggles, or a respirator worn, which has prescription lens, inserted into the respirator (full-face piece). Although OSHA allows contact lenses to be worn under full-face piece respirators, **Apex prohibits the wearing of contact lenses in any contaminated atmosphere regardless of the respiratory protection utilized.** Apex believes that a worker would try to remove the respirator to rub the eyes in a hazardous work area, should the eyes become irritated for any reason. This maneuver could subject the employee to injury.

Voluntary Use of Respirators

Employees that voluntarily wear respirators should be provided with OSHA's information for voluntary use of a respirator, which is included in the OSHA Respiratory Standard. A list of employees that voluntarily wear respirators should be maintained in each office and should include the following information:

- Employee name;
- Department that employee is assigned to;
- Tasks performed; and
- Type of respirator

Fit-Testing

Fit testing of persons required to wear a respirator should be performed every year and according to the procedures outlined in the most recent revision of 29 CFR 1910.134. Other OSHA Standards covering specific hazardous air contaminants should be reviewed when

working with specific air contaminants which may have their own unique requirements. **Records will be completed for each employee fit-tested**.

Respirator fit-testing should be repeated if an employee experiences any changes in facial features such as significant weight loss or weight gain, facial scarring or dental work.

Fit-testing records will be retained for respirator users until the next fit test is administered.

Employee Respiratory Protection Training

Refer to the Respiratory Protection Program Training, for the RPP's training requirements.

Annual Medical Evaluations

All Apex personnel assigned to jobs requiring the use of negative pressure respirators should first receive a medical evaluation by a Physician or other Licensed Health Care Professional (PLHCP) knowledgeable in pulmonary diseases and respiratory protection practice. The examining PLHCP will be given information about the equipment to be used. He/she should know whether the personal protective equipment would produce additional respiratory stress, whether it represents an additional weight, and whether it may cause an increase in the metabolic heat load.

Medical evaluation prior to fit testing will be confidential, during normal working hours, convenient, understandable, and the employee given a chance to discuss the results with PLHCP.

Personnel will not be assigned to tasks requiring the use of respirators unless it has been determined by the PLCHP that they are both psychologically and physically able to perform their duties while wearing the prescribed respirator.

The examining PLHCP will provide a written opinion, which describes the individual's ability to wear the respirator and the opinion should be forwarded to the Program Coordinator of each office. The Program Coordinator from each office will be a designated representative of the Central Safety Committee who has been assigned responsibilities for overseeing the RPP in that office.

The medical status of the respirator user should be part of the yearly evaluation of the program. The medical evaluation will include the use of the **OSHA Medical Evaluation Questionnaire** (see Appendices) or an initial medical examination that obtains the same information as the medical questionnaire. Written opinions will be maintained at the Human Resources office.

Apex will ensure that a follow-up medical examination is provided for an employee who gives a positive response to any question among questions 1 through 8 in Section 2, Part A of the OSHA Medical Evaluation Questionnaire.

Apex will provide a copy of the RPP to the PLHCP for review prior to having medical evaluations conducted. Once the PLHCP determines that the employee is physically able to wear a respirator, he/she will be allowed to perform any duties in areas requiring respirator use. A review of the employee's health status will be conducted annually provided that the employee's job description continues to require respirator use.

Record Keeping

Documentation is an important part of the RPP and is essential in tracking exposure information and employee training. The OSHA Respiratory Protection Standard, as well as other OSHA regulations specifies record keeping requirements including records of all environmental, biological and exposure monitoring and training. OSHA 29 CFR 1910.1020 requires that these records be made available to employees, upon request.

It is the responsibility of the RPP Program Coordinator at each office, or a designated representative, to maintain the employee respiratory protection records for the office. **All respiratory protection records should be kept by Apex for at least 30 years plus the length of employment for each employee covered by the RPP**. Records will be provided to the employee or the employee's designee upon written request.

Medical Records

Medical record keeping will be performed in accordance with all applicable OSHA regulations. A copy of the record will be provided to the employee (or designee) at his/her written request.

Fit-Testing Records

Fit testing of persons required to wear a respirator should be performed every year and according to the procedures outlined in 29 CFR 1910.134. Fit test records should be maintained for at least one year beyond the last date of employment.

Exposure Monitoring Records

Exposure monitoring is a requirement of several OSHA regulations. Monitoring the workplace air is required to ensure that respiratory protection measures being taken are adequate. The following items will be made part of the permanent record of any Apex employee exposure monitoring conducted:

- Name and social security number of employee monitored;
- Date monitored;
- Analyte monitored;
- Sampling method (OSHA or NIOSH) used;
- Sampling results;
- AIHA-accredited laboratory used;
- Type of respiratory protection used (e.g., ½ face, PAPR, etc.);
- Current PEL or TLV, or other helpful information such as REL;

- Current regulations governing exposure to, or work with, the analyte; and
- The action taken as a result of any monitoring program report recommendations.

Exposure monitoring records should be maintained in project files.

Program Evaluation

This RPP will be reviewed and evaluated on a regular basis to ensure the program's continued effectiveness and compliance with all applicable regulations. The review includes updating standard operating procedures and policies such as respirator selection guidance and adopting current permissible exposure limits, where applicable. The evaluation will be initiated by the Program Administrator and coordinated with each Apex office through the Apex RPP Coordinators and the Central Safety Committee, and will include a review of employee exposure information, medical surveillance records, training documentation, respirator assignment and fit-testing records, and the results of ongoing program compliance inspections.

A written evaluation of the RPP is to be prepared by the Program Administrator and submitted and discussed with Apex's Manager of Health and Safety. The written evaluation will be incorporated in a report that evaluates the Program's effectiveness. The written evaluation will assess whether:

- The proper types of respirators are selected and issued based upon workplace hazards, routine air monitoring results and NIOSH selection guidelines;
- Respirator users have been identified, properly trained, and medical evaluations are completed;
- The respirators are worn properly, as verified from an inspection;
- The respirators are properly maintained, cleaned and stored;
- Fit testing is documented and follows OSHA Respirator Fit Test protocol;
- All pertinent records are kept, including annual medical evaluations, fit testing and training records;
- The report includes results of the inspection, the effectiveness of the program administration, wearer acceptance, inadequacies and action to correct deficiencies with target dates;
- Consultation with respirator users included: resistance to breathing, fatigue, fit, selection, use, maintenance, interference with vision and communication, restriction of movement, job performance and confidence in the RPP;
- Follow-up medical evaluations and written opinions have been updated in employees personnel files;
- Evaluation made of new or modified operations have been completed which require respiratory protection; and,
- Whether verification has been made that engineering or administrative controls are used to minimize the need for respiratory protection.

A checklist, entitled the Respirator Program Evaluation Checklist, will be used for guidance with program evaluations. A copy of this form is located in Appendices.

References

- OSHA 29 CFR 1910.134, the Respiratory Protection Standard;
- OSHA 29 CFR 1910 Subpart Z, Permissible Exposure Limits for Toxic Substances
- OSHA 29 CFR 1926.1101, the Asbestos Standard for the Construction Industry
- OSHA 29 CFR 1910.1020, Access to Employee Exposure and Medical Records
- OSHA 29 CFR 1926.65/1910.120 Hazardous Waste Operations and Emergency Response
- OSHA 29 CFR 1926.62, Lead in Construction.
- OSHA 29 CFR 1910.1000, Air Contaminants, Subpart Z
- ANSI Z88.2, Practices for Respiratory Protection
- NIOSH Pub. No. 87-108, NIOSH Respirator Decision Logic
- AR 11-34, The Army Respiratory Protection Program (only if employees handle suspected military chemical agents)
- OSHA Respirator Information Website: http://www.osha.gov/SLTC/respiratoryprotection/index.html

OCCUPATIONAL MEDICAL MONITORING

Medical monitoring is required for all Apex personnel working in environments with potential exposure to health hazards.

An occupational medical monitoring program is essential to assess worker health and fitness, prior to employment, during the course of work activities, and upon termination of employment. Several OSHA regulatory requirements define actions, which need to be performed as part of the medical monitoring program. The medical monitoring program for all Apex personnel whose job may require working in environments with potential exposure to health hazards, such as hazardous wastes, excessive levels of microbiological contaminants; noise; and whose job may require the use of a respirator will consist of baseline, annual, and termination examinations.

The physical examination and associated activities will be administered by a physician or other licensed health care professional (PLHCP) specializing in occupational medicine. The examination criteria and frequency will be determined by the PLHCP based on guidance and regulatory requirements provided in the applicable OSHA regulations.

The Apex EHS Programs that require medical monitoring include:

- The Respiratory Protection Program
- The Hearing Conservation Program
- The Silicosis Prevention Program

- The HAZWOPER Program

Apex is also required to retain and provide personnel access to medical and exposure monitoring records in compliance with 29 CFR 1910.20 or 1926.33, Access to Employee Exposure and Medical Records.

The occupational medical program is not to be viewed as a general medical examination by personnel and should not be a substitute for regular check-ups by a family physician, nor viewed as a means of screening personnel for hidden health problems. Also, the occupational medical program is not designed to replace existing medical coverage compensation benefits that a person is entitled to if they become injured or sick on the job.

References

- OSHA 29 CFR 1910.134, the Respiratory Protection Standard;
- OSHA 29 CFR 1926.1101, the Asbestos Standard for the Construction Industry
- OSHA 29 CFR 1926.65/1910.120, Hazardous Waste Operations and Emergency Response
- OSHA 29 CFR 1926.62, Lead in Construction
- OSHA 29 CFR 1926.103/1910.134, Respiratory Protection
- OSHA 29 CFR 1926.52/1910.95, Occupational Noise Exposure
- OSHA 29 CFR 1926.65/1910.120, Hazardous Waste Operations and Emergency Response
- OSHA 29 CFR 1910.1020, Access to Employee Exposure and Medical Records

ACCIDENT/INJURY/NEAR-MISS REPORTING AND INVESTIGATION

Apex's definition of a reportable accident/injury incident includes motor vehicle, environmental, near miss accidents, property damage, fire, theft and other significant work-related incidents. **An Apex reportable incident is not necessarily OSHA Recordable**.

The tracking of all types of injuries, accidents and other incidents will enable Apex to identify detrimental trends and develop programs to minimize injuries and accidents in the future.

The sections below provide guidance for recordkeeping and reporting by Apex employees and for maintaining a program of collection, compilation and analysis of these incidents. This policy and associated procedures provides guidance to all offices to ensure compliance with OSHA 29 CFR Part 1904 - Recording and Reporting Occupational Injuries and Illnesses, and Apex's reporting of other significant work-related incidents.

Log and Summary of Occupational Injuries and Illnesses

Apex will maintain a log and summary of all OSHA recordable occupational injuries and illnesses for that office. Each recordable injury and illness will be logged no later than six (6) working days after receiving information that a recordable injury or illness has occurred. For this

purpose the **OSHA Form 300** will be used (see Section 9.3 References). The log and summary will be completed as per OSHA instructions on the No. 300 Log. Records will be maintained on a calendar year basis.

Supplementary OSHA Incident Reporting Record

In addition to recording OSHA injuries and illnesses on the 300 Log, Apex should have available for inspection at each establishment, within six (6) working days after receiving information that a recordable case has occurred, a supplementary record for each occupational injury or illness for that office or project site. The record should be completed in the detail prescribed in the instructions accompanying the **OSHA Form 301** (see Section 9.3 References). Workers' compensation, insurance, or other reports are acceptable alternative records if they contain the information required by OSHA Form 301.

Annual Summary

Apex will post an annual summary of occupational injuries and illnesses for each of its offices. This summary will consist of a copy of the year's totals from the OSHA Form 300 and the following information from that form: calendar year covered, company/establishment name, establishment address, certification signature and title, and date.

If no injuries or illnesses occurred in the year, zeros should be entered on the totals line, and the form be posted.

The summary should be completed for each Apex office by February 1st of the following year by the Manager of Human Resource Services.

The Manager of Human Resource Services will post a copy of Apex's summary, no later than February 1st. The posting will remain in place until May 1st. For Apex personnel who do not primarily report or work at a single location, or who do not report to a fixed office on a regular basis, Apex will satisfy this posting requirement by presenting or mailing a copy of the summary during the month of February of the following year to each such employee who receives pay during that month.

Retention and Access to Records

Apex will retain the OSHA 300 and 301 Forms for five (5) years following the end of the year to which they relate.

> Occupational illness/injury logs were recently revised. The previous versions of the 300 and 301 Forms are the OSHA No. 200 and No. 101 Form, respectively. Retain these records as you would the 300/301 Forms.

Apex will provide, upon request, these records for inspection and copying by any representative of the Secretary of Labor for the purpose of carrying out the provisions of the Occupational Safety and Health (OSH) Act, and by representatives of the Secretary of Health, Education, and

Welfare during any investigation, or by any representative of a State accorded jurisdiction for occupational safety and health inspections or for statistical compilation under the OSH Act.

Apex will also make available, upon written request, the OSHA Form 300 to any employee, former employee and to their representatives for examination and copying in a reasonable manner and at reasonable times, the log for any office in which the employee is or has been employed.

Procedure for Reporting Accidents and Injuries that are OSHA Recordable

In the event of an accident involving employee injury, the following process should be followed:

- Assist the injured employee and obtain appropriate medical treatment;
- Report on-the-job accidents/injuries to employee's Supervisor/Project Manager immediately;
- The Supervisor and employee will complete the accident/injury report (Apex incident report form);
- The Supervisor should conduct a thorough investigation to determine the root cause of the accident; and
- The Supervisor should develop and implement corrective action(s) to prevent accident/injury recurrence.

OSHA recordable work-related accident and injuries are those that result in one or more of the following:

- Medical treatment beyond first aid;
- Loss of consciousness;
- Restricted work;
- The accident/illness requires the employee to transfer to another job;
- Fatality or multiple hospitalization incidents;
- Diagnosis of a significant injury or illness; or
- Days away from work.

Apex's Human Resource team will record each recordable occupational injury or illness in the Log within six (6) working days after occurrence becomes known to Apex. Apex will record new work-related injuries and illnesses that meet one or more of the OSHA general recording criteria or meet the recording criteria for specific types of conditions.

OSHA does not require recording of injuries if they are minor injuries requiring only first aid treatment, and which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job. Consequently, a work-related injury should involve at least one of the previous conditions before it is considered recordable. Refer to OSHA 29 CFR 1904 for additional guidance on what is and is not recordable.

Fatality or Multiple Hospitalization Incidents

Within eight hours after the death of any employee from a work-related incident or the in-patient hospitalization of three (3) or more employees as a result of a work-related incident, Apex will orally report the fatality/multiple hospitalization by telephone (may contact the OSHA Hotline at 1-800-321-OSHA) or in person to the office of the Occupational Safety and Health

Administration (OSHA), U.S. Department of Labor, that is nearest to the site of the incident. This report will be made by, or coordinated through, the Apex Human Resources Director.

Procedures for Reporting Non-OSHA Recordable Accidents and Injuries (Motor Vehicle, Environmental Incidents, Property Damage, Fire, Near Miss Incidents and Other Potentially Significant Work-Related Incidents)

In addition to reporting OSHA Recordable Accidents and Injuries, Apex requires employees to report minor injuries and accidents that fall outside the OSHA reporting requirements.

Apex recordable incidents include: non-OHSA reportable accidents/injuries, motor vehicle incidents, environmental releases, property loss, fire, near miss and other potentially significant work related incidents that occur in the workplace.

These types of incidents should be reported on an Incident Report Form (see Appendices) and submitted to incidents@apexcos.com. This email reporting procedure ensures immediate communication to HR, H&S, insurance notification personal, and the leadership and will enable Apex to identify and track the types and frequency of significant work-related incidents that are occurring in the Apex offices and project sites. The Manager of Health and Safety will address incidents, occurring at a higher frequency.

Return to Work Program (Reserved)

References

- OSHA 29 CFR 1904 - Recording and Reporting Occupational Injuries and Illnesses
- Occupational Safety and Health Act
- OSHA No. 300 and 301 Logs (Note that these forms are in Microsoft Excel) http://www.osha.gov/recordkeeping/new-osha300form1-1-04.xls.

TEMPERATURE EXTREMES

Adverse and extreme weather or environmental conditions frequently become important considerations in planning and conducting work operations. Both indoors and outdoors, weather and working conditions can combine to create potentially hazardous extreme temperature conditions that can cause physical discomfort, loss of efficiency, impairment of judgment, and personal injury, even death. If the body's physiological processes fail to maintain a normal body temperature because of excessive heat or cold, a number of physical reactions can occur ranging from fatigue and abnormal behavior to collapse, unconsciousness, and ultimately death. In addition to the environmental factors affecting a worker; personal characteristics such as age, weight, fitness, medical condition and acclimatization are also important considerations in determining effects of temperature stress on a worker.

One of the greatest factors affecting the levels of stress on workers can be the use of PPE. Even in moderate temperature environments, conditions inside protective clothing may be extreme enough to cause a temperature stress situation. Thus, addressing the hazards related to temperature extremes can help prevent injury and illness.

The most recent revision of the ACGIH TLVs and BEIs booklet contains detailed information on heat and cold stress and is recommended to be used by Apex personnel as a reference and supplement to our program.

Heat Related Illnesses

The stress of working in areas of high heat, humidity and radiant heat can cause a variety of strains on the body, including heat exhaustion or heat stroke. The symptoms of heat stress need to be recognized and necessary actions implemented when they occur.

Heat stress can be a major hazard for Apex employees wearing PPE working at hazardous waste sites, inside confined spaces or in other areas. The same protective materials that protect the body from chemical exposure also limit the body's ability to cool itself. Heat stress can occur very rapidly depending upon certain ambient conditions and work being performed. Heat stress can pose as great a danger to worker health as chemical exposure.

To minimize the potential for heat stress problems at the job site, Apex has developed these guidelines on heat-related illnesses that should be reviewed by employees prior to job assignments and incorporated into Site-Specific Health and Safety Plans (SSHPs) so that early symptoms of heat stress are recognizable by all employees and prompt corrective first aid measures can be taken to minimize the potential for more serious heat-related illnesses.

In the preliminary stages of heat stress, rashes, cramps, discomfort and drowsiness can occur resulting in impaired functional ability that threatens the safety of both the individual and coworkers. Continued heat stress can lead to heat stroke and death. Avoiding overprotection, careful training and frequent monitoring of personnel who wear protective clothing, strategic scheduling of work and rest periods, and frequent replacement of fluids can protect against heat stress hazards.

Care should be taken when selecting chemical-protective clothing (CPC). The thermal insulation value ("CLO" value) of CPC is a measure of the capacity of CPC to dissipate heat through means other than evaporation. Given other equivalent protective properties, clothing with the lowest CLO value should be selected in hot environments or for high work rates.

Ambient temperature has a major influence on work duration as it affects both the worker and the protective integrity of PPE. Heat stress, which can occur even in relatively moderate temperatures, is the greatest immediate danger to an encapsulated worker. Hot ambient temperatures and relatively elevated humidity levels also affect:

- The durability and flexibility of PPE;
- The valve operation on suits and/or respirators;
- The concentration of airborne contaminants in the work zone; and
- The breakthrough time and permeation rates of chemicals.

Any of these factors has the potential for decreasing the duration of protection provided by a given piece of clothing or respiratory equipment. These factors should be considered in selecting appropriate PPE for the project. In addition, a person's body will need to be physiologically adjusted, or acclimatized, to working under hot conditions. **NIOSH recommends a progressive six-day acclimatization period for the un-acclimatized worker before allowing them to perform full work duties on a hot job site.**

The following table summarizes the stages, symptoms and first aid measures for victims of heat stress.

STAGES, SYMPTOMS AND FIRST AID MEASURES FOR HEAT STRESS

STAGE	SYMPTOMS	FIRST AID MEASURES
Heat Cramps	Sweaty skin Painful muscle spasms Normal body temperature	Give fluids Gently massage cramped muscles
Heat Exhaustion	Clammy or pale skin Weakness and fatigue Profuse sweating Nausea, vomiting Disorientation Headache Normal or slightly elevated body temperature	Remove victim from heat Loosen clothing Sponge skin with cool water Fan victim but stop if victim shivers or develops goose bumps Give fluids. Give victim a drink solution of one pint water and one teaspoon salt every 30 minutes until victim recovers Obtain medical help if victim does not improve
Heat Stroke	Unconsciousness or mental confusion Dizziness Staggered walk	Get emergency medical aid immediately Remove victim from heat Remove clothing, place victim in

STAGE	SYMPTOMS	FIRST AID MEASURES
	Appears to be agitated Hot, dry skin Extremely high body temperature; could reach or exceed 105º F	a cool bath, or apply cool compresses Do not give any fluids Do not leave victim alone Do not allow victim to become so cold that victim shivers Do not give aspirin or other medication in an attempt to lower fever

Ways to reduce or prevent heat stress include use of body cooling devices and work time limits. Frequent rest cycles to cool down and replace the body fluids and electrolytes lost through perspiration should be employed to control heat related illnesses

Cold Stress

The stress of working in a cold environment can cause a variety of strains on the body, and the frequency of accidents may be higher in cold environments. Nerve impulses are slowed, exposed workers react sluggishly, fumble with their hands and become clumsy. There are also safety problems common to cold environments. They include ice, snow blindness, reflection from snow and the possibility of burns from contact with cold metal surfaces.

Thermal injury due to cold exposure can become a problem for Apex field personnel. Systemic cold exposure is known as hypothermia. Localized cold exposure is generally considered to be categorized as frostbite.

Prevention of cold-related illness can be aided by educating workers on recognizing the symptoms of frostbite and hypothermia and by identifying and limiting known risk factors. The workers should be provided with enclosed, heated shelters on, or adjacent to, the worksite, dry changes of clothing and warm drinks. When working in extremely cold climates, frequent work breaks should be encouraged.

To monitor site personnel for cold-related illnesses, commence oral temperature recordings at the job site:

- At the supervisor's discretion when suspicion is based on changes in a worker's performance or mental status;
- When a worker requests monitoring;
- As a screening measure, at least twice per shift, under extremely hazardous climatic conditions (for example, when the wind-chill is less than 20ºF, or wind-chill is less than 30ºF with precipitation); and
- As a screen measure whenever any person develops hypothermia.

Workers developing moderate hypothermia, in which the core temperature drops to 92ºF, should not return to work for at least 48 hours, if adverse weather conditions continue.

Apex personnel should be trained to minimize the risk of the hazards of working in cold environments and periodically reinforced in the recognition of the physiologic responses of the body to cold stress. The use of insulated work clothing, warm shelters and work/warming regimens should be used to minimize the potential hazards of cold stress. Also, special attention should be given to equipment warm-up time and freeze protection for vessels, piping, equipment, tools, and walking/working surfaces.

Control measures to prevent cold related symptoms include:

- Prevent continuous exposure of skin when the wind-chill factor results in an equivalent temperature of -32º C (-26º F). Workers exposed to air temperatures of 2º C (35.6º F) or lower who become immersed in water or whose clothing gets wet should change into dry clothing immediately and be treated for hypothermia;
- Use heated warming shelters such as tents and cabins when work is performed continuously in an equivalent chill temperature o f -7º C (20º F) or below;
- Ensure frequent intake of warm, sweet, caffeine free, non-alcoholic drinks or soup;
- Minimize sitting still or standing for long periods of time; and
- Ensure use of appropriate PPE. The correct clothing depends on the specific cold stress situation. It is important to preserve the air space between your body and the outer layer of clothing in order to retain body heat. The more air pockets each layer of clothing has, the better the insulation. However, the insulating effect is negated if the clothing interferes with the evaporation of sweat, or if the skin or clothing is wet.

References

- TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH 2003.

HEARING CONSERVATION PROGRAM

Unprotected exposure to high levels of continuous or impulse noise can cause permanent hearing loss. The greater the intensity, the higher the frequency, and/or the longer the exposure, the more damaging is the effect on the auditory mechanism and the loss of hearing. Where personal noise levels exceed OSHA's Occupational Noise Exposure Standard, workers should be protected by the institution of engineering controls that reduce the noise to acceptable levels. Where implementing engineering controls is not feasible, appropriate hearing protection will be furnished and used by affected personnel.

For all Apex employees exposed to continuous noise in excess of the specified 85 dBA "action level", an effective Hearing Conservation Program should be established in accordance with OSHA regulations.

Occupational Noise Exposure Limits

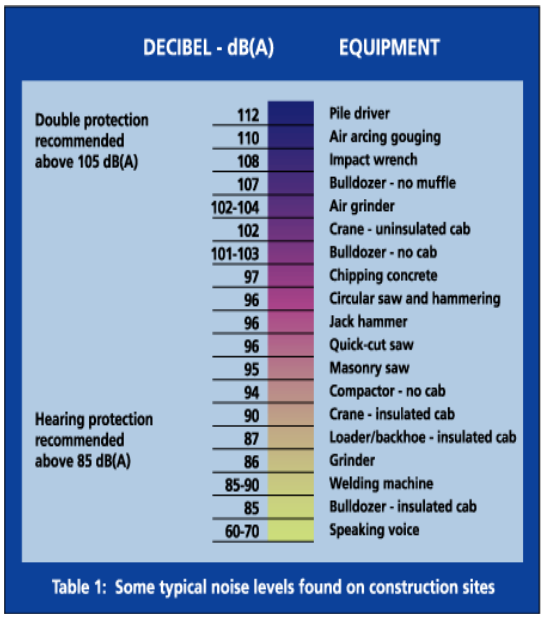
Apex employees and project workers should be protected against the harmful effects of noise exposure when sound levels exceed OSHA's permissible exposure levels. These exposures are presented in the table below.

PERMISSIBLE NOISE EXPOSURES

DURATION PER DAY (hours)	SOUND LEVEL SLOW RESPONSE (dBA*)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115**

** Decibels A-weighted.*
*** Maximum exposure of 115 dBA for 15 minutes or less.*
Impact (impulsive) noise limited to a maximum of 140 dBA (peak);
Various combinations of duration and intensity are permissible; and
Exposure limits for various durations, pursuant to Table G-16 of 29 CFR 1910.95.

Noise levels in excess of 85 dBA are possible at Apex worksites given the nature of the work activities. The Figure below provides an estimate of noise levels that correspond to particular activities.



Typical noise levels found at construction sites

When workers are subjected to noise exceeding the above levels, feasible engineering or administrative controls should be used. If such controls fail to reduce the noise to the specified levels, hearing protectors should be provided. Employing administrative controls, (i.e., rotating employees or limiting their duration of exposure) for compliance purposes instead of engineering controls is acceptable.

Hearing Conservation Program

An effective Hearing Conservation Program will be developed and implemented whenever employee noise exposures equal or exceed an eight-hour time weighted average (TWA) of 85 dBA (Action Level) measured on the A scale, slow response setting. In accordance with OSHA standards the program should at a minimum contain the elements discussed below.

Monitoring: A work area noise monitoring program will be implemented in order to identify employees for inclusion in the Hearing Conservation Program to enable the proper selection of hearing protectors. Monitoring of the noise environment should be repeated whenever a change work conditions produce increases in the noise level above 85 dBA TWA, or when the hearing protector's noise attenuation properties may be rendered inadequate. Noise exposure should be measured within the hearing zone of the affected employee. Personal noise dosimeters will be used for mobile workers and where noise levels and durations vary.

Employee Notification: Each monitored employee exposed at or above 85 dBA TWA will be notified of the results of the monitoring in a timely manner;

Observation of Monitoring: Employees will be provided the opportunity to observe any noise measurements being conducted;

Audiometric Testing: Audiometric testing will be made available at no cost to all employees whose exposures equal or exceed an 85 dBA TWA. An employee, who has been exposed to noise at or above this level, will have a baseline audiogram within six months of the initial exposure. Testing to establish a baseline audiogram shall be preceeded by at least 14 hours without exposure to workplace noise. Hearing protection may be used to meet the requirement. New audiograms will be provided, at least annually thereafter, to employees who are exposed at or above 85 dBA TWA. Annual audiograms will be compared to the employee baseline audiogram to determine if a standard threshold shift has occurred. A standard threshold shift (STS) is a change in hearing threshold relative to the baseline audiogram. STS can indicate the lack of effectiveness of the Hearing Conservation Program and help to identify workers who are beginning to lose their hearing due to excessive noise exposure. An audiologist, otolaryngologist, or physician will review problem audiograms and determine if further evaluation is necessary; and if a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employee shall be informed of this fact in writing, within 21 days of the determination. If a threshold shift has occurred, use of hearing protection shall be re-evaluated and/or refitted and if necessary a medical evaluation may be required.

Hearing Protectors: Hearing protectors (e.g., plugs, muffs) will be made available at no cost to all Apex personnel whose exposures equal or exceed 85 dBA TWA. Employees will be given the opportunity to select hearing protection from a variety of hearing protectors. Employees will be trained in the use and care of hearing protectors. Supervisors will ensure that hearing protection is worn, where required. All personnel, including those in a hearing protection environment, should be able to hear essential communications and/or emergency alarms. Selected hearing protectors will be capable of reducing the worker noise exposure level to a TWA of 85 dBA. Where noise levels exceed 100 dBA, dual hearing protection (i.e., ear plugs and muffs) should be worn.

Hearing Protector Attenuation: Hearing protector attenuation will be evaluated for the specific noise environment in which the protector will be used. The adequacy of hearing protector attenuation will be re-evaluated whenever employee exposures increase to the extent that the hearing protectors provided may no longer provide adequate protection.

> Hearing protectors may provide as little as half the attenuation claimed by the manufacturer in actual workplace use. Caution should be used when applying manufacturer's noise attenuation rating for hearing protectors.

Access to Information and Training Materials: Copies of the OSHA Noise Exposure Standard will be made available to affected personnel and copies will be posted in workplaces covered by this standard. Additional materials related to noise exposures including all test results, interpretations, and all training and education materials will also be provided.

Record Keeping: Noise exposure records will be retained for a period of at least two years. Audiometric test records will be maintained for the duration of the affected employee's employment. Noise exposure records will be made available to employees, employee's representatives and OSHA upon request.

Training Requirements

Refer to Section on Hearing Conservation Program Training.

Program Evaluation

An Apex EHS specialist will annually review the effectiveness of the Hearing Conservation Program. The EHS specialist should review the following Program aspects:

- Are proper noise exposure controls being used?
- Are proper methods of noise protection being used?
- Have areas of high noise been identified?
- Have appropriate and proper records been kept?
- Are signs posted, and are they adequate?
- Is the proper training being held?

- Was a program evaluation conducted within the past year?

References

- OSHA 29 CFR 1926.52/1910.95, Occupational Noise Exposure
- OSHA 29 CFR 1910.1020, Access to Employee Exposure and Medical Records

HAZARD COMMUNICATION (HAZCOM)

Hazard communication is based on the rationale that when workers are proactively informed about hazards and how to protect themselves from those hazards, the incidence of chemically-related illnesses and injuries will decrease significantly. This process can be accomplished through worker hazard awareness training, by ensuring that all hazardous chemical materials and containers are appropriately labeled, and by providing access to chemical specific Safety Data Sheets (SDSs).

A HAZCOM program, which meets the requirements of OSHA, will be implemented for project personnel who work with chemicals.

The HAZCOM program will incorporate the following elements:

- A listing of all hazardous chemicals present at the work site;
- A collection of all SDSs for each of the chemical products included on the list;
- A method of making SDSs available and accessible to employees;
- A method for assigning responsibility for implementation of the HAZCOM program;
- A training program for all employees concerning the HAZCOM program and controlling the hazards associated with the various chemical products present in their work environment;
- A method for ensuring that all chemical product containers in use at the job site are appropriately labelled;
- A method for ensuring that contractors working on the same job site exchange information concerning their respective HAZCOM programs; and
- Procedures for maintaining the HAZCOM program is current and effective.

Each Apex project will have specific chemical hazards identified that will need to be communicated to employees. The following HAZCOM program will be used as a base template for the Apex office and job sites. Each work area should maintain SDSs for hazardous materials associated with each area.

Hazard Communication Program

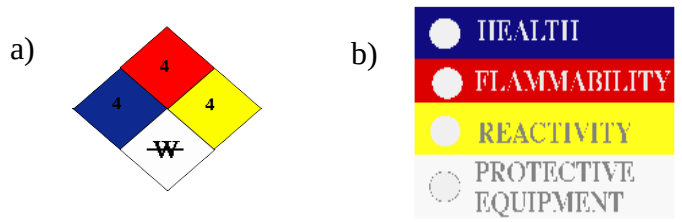
In compliance with revised OSHA Hazard Communication Standard, the following written HAZCOM program is being implemented for the personnel of Apex. The project H&S manager will keep a copy of this program in the office or work area.

The responsible person for the implementation of the HAZCOM program is a H&S designated project manager.

This program applies to all work operations at Apex or any job site where personnel may be exposed to hazardous substances under normal working conditions or during an emergency situation. A copy of this program will be made available to any new employee upon hiring, upon transfer of employees to operations involving hazardous materials, and upon request to any current employee. A copy of this program is available to download on the H&S page of ARTIS.

Under this program, employees will be informed of the contents of the Hazard Communication Standard, the properties of hazardous chemicals with which they work, safe handling procedures, correct PPE to use, and proper disposal measures to protect themselves from harmful exposures to these chemicals. This will be accomplished by providing the following:

- An updated inventory list of hazardous chemicals in all work locations;
- SDS or similar documents, which provide information on hazardous properties and protective measures that employees can take;
- NFPA-704 or HMIS labels on all containers of hazardous chemicals (see Figure below); Labels shall be legible, in English. However, for non-English speaking employees, information may be presented in their language as well; and
- Employee training and education on hazardous substances.



Examples of a) NFPA and b) HMIS labels.

This program will be updated when new chemicals or hazardous materials are introduced into the working environment, or at a minimum, reviewed annually by the Corporate Health and Safety Manager.

Inventory List of Hazardous Chemicals

Apex will maintain an inventory list of chemicals or products containing hazardous chemical ingredients that are used at our work sites or stored at our office or warehouse location. . A designated H&S specialist shall maintain the original list and copies will be made available to personnel upon request. When working for other companies or as a subcontractor on larger projects, the host facility will provide a hazardous chemical list.

Any Apex personnel who orders chemicals are responsible for checking all chemical purchase requests to be sure a statement requesting a SDS appears on the purchase request before being processed.

Safety Data Sheets (SDS)

Safety Data Sheets will provide employees with specific information regarding the chemicals used during work activities. A three-ring binder will include SDSs on all hazardous materials and will be labeled SDSs. The SDS files will be kept at the Apex office, at job sites, and available on the H&S page of ARTIS where copies will be accessible at all times to all employees.

The information required on the safety data sheet (SDS) will remain essentially the same as that in the current standard. The current Hazard Communication Standard (HCS) indicates what information has to be included on an SDS but does not specify a format for presentation or order of information. The revised HCS requires that the information on the SDS is presented using consistent headings in a specified sequence.

Paragraph (g) of the final rule indicates the headings of information to be included on the SDS and the order in which they are to be provided. In addition, Appendix D indicates what information is to be included under each heading. The SDS format is the same as the ANSI standard format which is widely used in the U.S. and is already familiar to many employees.

The format of the 16-section SDS should include the following sections:

Section 1. Identification
Section 2. Hazard(s) identification
Section 3. Composition/information on ingredients
Section 4. First-Aid measures
Section 5. Fire-fighting measures
Section 6. Accidental release measures
Section 7. Handling and storage
Section 8. Exposure controls/personal protection
Section 9. Physical and chemical properties
Section 10. Stability and reactivity
Section 11. Toxicological information
Section 12. Ecological information
Section 13. Disposal considerations
Section 14. Transport information
Section 15. Regulatory information
Section 16. Other information, including date of preparation or last revision

Sections 12-15 may be included in the SDS, but are not required by OSHA.

In the revised Hazard Communication Standard (HCS), OSHA has added pyrophoric gases, simple asphyxiants and combustible dust to the definition of "hazardous chemical". OSHA has also added definitions to the revised HCS for pyrophoric gases and simple asphyxiants, and provided guidance on how to define combustible dust for the purposes of complying with the HCS.

- **Pyrophoric gases**:
  OSHA has retained the definition for pyrophoric gases from the current HCS. Pyrophoric gases must be addressed both on container labels and SDSs. OSHA has provided label elements for pyrophoric gases which include the signal word "danger" and the hazard statement "catches fire spontaneously if exposed to air".
- **Simple asphyxiants:**
  OSHA has revised the definition of simple asphyxiants that was proposed in the Notice of Proposed Rulemaking (NPRM) as a result of comments from the regulated community. In the final HCS, simple asphyxiants must be labeled where appropriate, and be addressed on SDSs. OSHA has provided label elements for simple asphyxiants which include the signal word "warning" and the hazard statement "may displace oxygen and cause rapid suffocation".
- **Combustible dust:**
  OSHA has **not** provided a definition for combustible dust to the final HCS given ongoing activities in the specific rulemaking, as well as in the United Nations Sub-Committee of Experts on the GHS (UN/SCEGHS). However, guidance is being provided through existing documents, including the Combustible Dust National Emphasis Program Directive CPL 03-00-008, which includes an operative definition, as well as provides information about current responsibilities in this area. In addition, there are a number of voluntary industry consensus standards (particularly those of the NFPA) that address combustible dust.

  In the final HCS, combustible dust hazards must be addressed on labels and SDSs. Label elements are provided for combustible dust in the final HCS and include the signal word "warning" and the hazard statement "May form combustible dust concentrations in the air".

  For chemicals in a solid form that do not present a combustible dust hazard, but may form combustible dusts while being processed in normal downstream uses, paragraph (f)(4) of the HCS allows the chemical manufacturer some flexibility in labeling requirements. The manufacturer or importer to may transmit the label to the customer at the time of the initial shipment, but the label does not need to be included with subsequent shipments unless it changes. This provides the needed information to the

downstream users on the potential hazards in the workplace, while acknowledging that the solid metal or other materials do not present the same hazards that are produced when these materials are processed under normal conditions of use.

The Project Manager or project H&S specialist is responsible for acquiring and updating SDSs and will contact the appropriate sources in the event a vendor or chemical manufacturer has not supplied a current SDS with an initial shipment. New chemicals should not be used until an SDS has been obtained and reviewed by the H&S specialist. **The Chemical Inventory List** will contain all SDSs that have been filed in the binder.

Labels and Other Forms of Warning

OSHA has revised the Hazard Communication Standard to improve the quality and consistency of hazard information. The Hazard Communication Standard (HCS) is now aligned with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). This update to the Hazard Communication Standard (HCS) will provide a common and coherent approach to classifying chemicals and communicating hazard information on labels and safety data sheets. Once implemented, the revised standard will improve the quality and consistency of hazard information in the workplace.

Major changes to the Hazard Communication Standard

- **Hazard Classification**: Provides specific criteria for classification of health and physical hazards, as well as classification of mixtures.
- **Labels**: Chemical manufacturers and importers will be required to provide a label that includes a harmonized signal word, pictogram, and hazard statement for each hazard class and category. Precautionary statements must also be provided.
- **Safety Data Sheets:** Will now have a specified 16-section format.
- **Information and Training:** Employers are required to train workers by December 1, 2013 on the new labels elements and safety data sheets format to facilitate recognition and understanding.

The table below summarizes the phase-in dates required under the revised Hazard Communication Standard (HCS):

Effective Completion Date	Requirement(s)	Who
December 1, 2013	Train employees on the new label elements and safety data sheet (SDS) format.	Employers
June 1, 2015* December 1, 2015	Compliance with all modified provisions of this final rule, except: The Distributor shall not ship containers labeled by the chemical manufacturer or importer unless it is a GHS label	Chemical manufacturers, importers, distributors and employers

Effective Completion Date	Requirement(s)	Who
June 1, 2016	Update alternative workplace labeling and hazard communication program as necessary, and provide additional employee training for newly identified physical or health hazards.	Employers
Transition Period to the effective completion dates noted above	May comply with either 29 CFR 1910.1200 (the final standard), or the current standard, or both	Chemical manufacturers, importers, distributors, and employers

*This date coincides with the EU implementation date for classification of mixtures

During the phase-in period, employers would be required to be in compliance with either the existing HCS or the revised HCS, or both. OSHA recognizes that hazard communication programs will go through a period of time where labels and SDSs under both standards will be present in the workplace. This will be considered acceptable, and employers are not required to maintain two sets of labels and SDSs for compliance purposes.

Under both the current Hazard Communication Standard (HCS) and the revised HCS, an evaluation of chemical hazards must be performed considering the available scientific evidence concerning such hazards. Under the current HCS, the hazard determination provisions have definitions of hazard and the evaluator determines whether or not the data on a chemical meet those definitions. It is a performance-oriented approach that provides parameters for the evaluation, but not specific, detailed criteria. The hazard classification approach in the revised HCS is quite different. The revised HCS has specific criteria for each health and physical hazard, along with detailed instructions for hazard evaluation and determinations as to whether mixtures or substances are covered. It also establishes both hazard classes and hazard categories—for most of the effects; the classes are divided into categories that reflect the relative severity of the effect. The current HCS does not include categories for most of the health hazards covered, so this new approach provides additional information that can be related to the appropriate response to address the hazard. OSHA has included the general provisions for hazard classification in paragraph (d) of the revised rule, and added extensive appendixes (Appendixes A and B) that address the criteria for each health or physical effect.

Under the current Hazard Communication Standard (HCS), the label preparer must provide the identity of the chemical, and the appropriate hazard warnings. This may be done in a variety of ways, and the method to convey the information is left to the preparer. Under the revised HCS, once the hazard classification is completed, the standard specifies what information is to be provided for each hazard class and category. Labels will require the following elements:

- **Pictogram:** a symbol plus other graphic elements, such as a border, background pattern, or color that is intended to convey specific information about the hazards of a chemical. Each pictogram consists of a different symbol on a white background within a

red square frame set on a point (i.e. a red diamond). There are nine pictograms under the GHS. However, only eight pictograms are required under the HCS.

- **Signal words:** a single word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used are "danger" and "warning." "Danger" is used for the more severe hazards, while "warning" is used for less severe hazards.
- **Hazard Statement:** a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.
- **Precautionary Statement:** a phrase that describes recommended measures to be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical, or improper storage or handling of a hazardous chemical.

There are nine pictograms under the GHS to convey the health, physical and environmental hazards. The final Hazard Communication Standard (HCS) requires eight of these pictograms, the exception being the environmental pictogram, as environmental hazards are not within OSHA's jurisdiction. The hazard pictograms and their corresponding hazards are shown below.

HCS Pictograms and Hazards

Health Hazard	**Flame**	**Exclamation Mark**
• Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	• Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	• Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non Mandatory)
Gas Cylinder	**Corrosion**	**Exploding Bomb**
• Gases under Pressure	• Skin Corrosion/ burns • Eye Damage • Corrosive to Metals	• Explosives • Self-Reactives • Organic Peroxides
Flame over Circle	**Environment (Non Mandatory)**	**Skull and Crossbones**
• Oxidizers	• Aquatic Toxicity	• Acute Toxicity (fatal or toxic)

In the revised Hazard Communication Standard (HCS), OSHA is lifting the stay on enforcement regarding the provision to update labels when new information on hazards becomes available. Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within **six months** of becoming aware of the new information, and shall ensure that labels on containers of hazardous chemicals shipped after that time contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importer, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

The current standard provides employers with flexibility regarding the type of system to be used in their workplaces and OSHA has retained that flexibility in the revised Hazard Communication Standard (HCS). Employers may choose to label workplace containers either with the same label that would be on shipped containers for the chemical under the revised rule, or with label alternatives that meet the requirements for the standard. Alternative labeling systems such as the National Fire Protection Association (NFPA) 704 Hazard Rating and the Hazardous Material Information System (HMIS) are permitted for workplace containers. However, the information supplied on these labels must be consistent with the revised HCS, e.g., no conflicting hazard warnings or pictograms.

The Project Manager or project H&S specialist will ensure that all hazardous chemical labels at Apex are updated as necessary. At a minimum, labels will list the chemical identity, appropriate hazard warnings and the name, address and telephone number of the manufacturer.

NFPA Labels

NFPA labels are diamond-shaped with four colored diamonds with hazard identification numbers that correspond to the following:

RED = Fire Hazard
YELLOW = Reactivity Hazard
BLUE = Health Hazard
WHITE = Special Instructions

0 = material offers little or no hazard
1 = material offers minimal risk
2 = material offers a moderate risk
3 = material offers a very serious risk
4 = material offers extreme danger

OX = oxidizer, ACID = acid, ALK = alkali, -W- = water reactive
BASE = base, COR = corrosive, RAD = radioactive

HMIS Labels

HMIS labels are usually rectangular in shape and have the same color-coding and numbering as the NFPA labels, except there is no special instruction section present. Instead you will notice a white or green section entitled PPE, or personal protective equipment. A coded legend will be located on the right hand side of the label that uses alphabet letters A through K and X, which corresponds to a certain type of PPE to wear.

The Project Manager or project H&S specialist will refer to the **Chemical Inventory List** and corresponding SDS to assist in verifying correct label information. All primary containers of hazardous chemicals will be checked by the Project Manager or project H&S specialist before being placed in the working environment for use by personnel, to be sure they are properly labeled.

No Apex personnel are ever allowed to remove or deface a label on incoming containers of chemicals. If a label is found to be missing, defaced, or illegible, do not use this material until a proper label has been obtained and put into place. Always read the label and check the hazard ratings/warnings before using any product that contains hazardous ingredients.

If chemicals are transferred from a primary container to a secondary (portable, smaller) container that is intended for immediate use or under the direct control of the intended employee, or by the end of the work shift, no labels are required on the portable container. If these conditions cannot be met, then the employee conducting the chemical transfer should obtain a proper label.

Employee Education and Training

Apex shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new chemical hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and safety data sheets.

Employees shall be informed of:

- The requirements of this section;
- Any operations in their work area where hazardous chemicals are present; and,
- The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and safety data sheets required by this section.

Training. Employee training shall include at least:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer,

continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

- The physical, health, simple asphyxiation, combustible dust, and pyrophoric gas hazards, as well as hazards not otherwise classified, of the chemicals in the work area;
- The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and,
- The details of the hazard communication program developed by the employer, including an explanation of the labels received on shipped containers and the workplace labeling system used by their employer; the safety data sheet, including the order of information and how employees can obtain and use the appropriate hazard information.

Non-Routine Tasks

Before any non-routine task is performed, employees should be advised or they should review the SDS or other reference materials for special precautions to follow. Any other personnel who could be potentially exposed during this non-routine task will also be informed of the same special precautions.

Other Personnel Exposure

It will be the responsibility of the Project Manager to provide other site visitors or outside contractors who perform work on the premises of Apex or at host-facility job sites with the following information:

- Hazardous chemicals to which they may be exposed while in the workplace;
- Measures to control the potential of exposure;
- Location of SDS's for all hazardous chemicals; and
- Emergency procedures to follow if they are exposed.

The Project Manager will also be responsible for contacting each contractor before work is started to obtain any information concerning chemical hazards that the contractor is bringing onto Apex job sites.

Non-English Speaking Employees

At this time, Apex does not have any non-English speaking employees. If this changes in the future, provisions will be made at that time for such occasion to include information specific to their language. It is the policy of Apex to provide equal opportunities without regard to race, color, national origin, sex, age, qualified handicapped, veteran, or physical mental ability in its employment practices.

Uncontrolled Releases

In the event an uncontrolled release of a hazardous material occurs while on the premises of Apex or on site at a host facility, the involved employee(s) will evacuate the area and immediately notify, by any means, Apex Management or the appropriate host-facility operator.

References

- OSHA 29 CFR 1910.1200/1926.59, Hazard Communication

BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN

Workers who have direct exposure to blood or other potentially infectious materials on the job run the risk of contracting certain bloodborne infections. The two most significant bloodborne pathogens are hepatitis B virus (HBV) and human immunodeficiency virus (HIV). Currently, HBV is the major infectious bloodborne hazard encountered on the job. Approximately 8,700 healthcare workers are infected by HBV each year, resulting in 400 hospitalizations and 200 deaths. HIV, which causes the disease known as Acquired Immune Deficiency Syndrome (AIDS), also presents a serious bloodborne hazard, but is not as prominently transmitted through occupational exposure.

Occupational transmission of bloodborne pathogens occurs when infectious materials are passed into the body. These pathogens are predominantly present in blood, but may also be present in other bodily fluids. Bloodborne pathogens may enter the body through accidental injury with sharp contaminated objects (i.e. needles), open passageways to the skin (i.e. cuts) or mucous membrane (i.e. mouth, nose or eyes) or any other means of transporting the infectious material into the body.

In general, the standard applies to all “reasonably anticipated” exposure or contact with blood or other potentially infectious materials that may result from the performance of an employee’s duties. Refer to the most recent revision of the OSHA Standard for additional information.

Apex falls under the requirements of the Standard through the exposure of employees to sharp contaminated objects at job sites. This exposure risk poses “reasonably anticipated” exposure or contact with blood or other potentially infectious materials.

In compliance with OSHA standards, Apex has developed this written Exposure Control Plan utilizing information and excerpts provided within the OSHA Standard and guidance manuals.

Exposure Control Plan

In order to minimize the risk of occupational exposure to bloodborne pathogens, Apex has developed a written Exposure Control Plan.

An Exposure Control Plan is divided into five sections and will cover:

1. Exposure Determination;
2. Methods of Compliance;
3. Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-Up;
4. Communication of Hazard to Employees; and
5. Recordkeeping.

Exposure Determination

According to OSHA, Apex is required to perform an exposure determination concerning which employees may incur occupational exposure to blood or other potentially infectious materials, without regard to the use of personal protective equipment. The exposure determination is required to list all job classifications in which all employees have occupational exposure. Currently, Apex does not have any job classifications in this category.

In addition, OSHA requires a listing of job classifications in which some employees have occupational exposure. In order to differentiate those employees with occupational exposure within this category, OSHA also requires a list of tasks and procedures resulting in occupational exposure within each job classification. Apex has the following job classifications and associated task(s) in which some employees have the potential for occupational exposure:

Methods of Compliance

Apex will utilize universal precautions, engineering controls, and personal protective equipment to comply with the standard promulgated by OSHA.

Universal Precautions

Universal precautions should be observed by all Apex employees to prevent contact with blood or other potentially infectious materials.

Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids should be considered potentially infectious materials.

Engineering Controls

Engineering and work practice controls should be used to eliminate or minimize employee exposure. Based on the nature of Apex's occupational exposure, engineering controls can only minimize (not eliminate) employee exposure. The three (3) engineering controls implemented by Apex are:

- Wash all body parts which came in contact with infectious material. Ensure employees wash hands following removal of gloves or contact with blood or other potentially infectious materials. If hand-washing facilities are not feasible, an appropriate antiseptic hand cleaner or towlette

and clean cloth/paper towel will be provided. Mucous membrane will be flushed with water immediately, or as soon as feasible, following contact of such body areas with blood or other potentially infectious materials;

- Eating, drinking, chewing gum, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure; and
- Red biohazard bags will be used to collect and dispose contaminated materials. Specimens of blood or other potentially infectious materials must be put in leak proof bags for handling, storage and transport.
- All equipment or environmental surfaces shall be cleaned & decontaminated after contact with blood or other infectious materials.

Personal Protective Equipment (PPE)

When there is anticipated occupation exposure, Apex will provide PPE at no cost to the employee. PPE will be considered "appropriate" only if it does not permit blood or other potentially infectious materials to pass through to, or reach, the employee under normal circumstances of use and for the duration of time used. Based on the nature of Apex's occupational exposure, the following PPE will be distributed.

Personal Protective Equipment to be Distributed to Apex Employees

Disposable Surgical Gloves	First Aid (if necessary)
Disposable Face Shield	First Aid (if necessary)
Disposable CPR mask	CPR (if necessary)

Apex will utilize disposable PPE for all situations with anticipated occupational exposure. All contaminated PPE will be replaced as soon as feasible and disposed of in designated red biohazard bags. PPE will be used on a single use basis only. Apex will store PPE with designated first aid kits.

Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-Up

Apex will make available the hepatitis B vaccine, vaccination series, post-exposure evaluation and follow-up to all employees who have occupational exposure to blood and other potentially infectious materials as defined in this section. These services will be made available at no cost to the employee and at a reasonable time and place. All services will be performed or supervised by Apex's Occupational Health Physician and according to current recommendations of the U.S. Public Health Service. All laboratory tests will be conducted by an accredited laboratory.

Hepatitis B Vaccination

Apex will make the hepatitis B vaccine and vaccination series available to all personnel with occupational exposure to blood or other potentially infectious materials as defined in this section. The vaccination will be offered within ten (10) days of initial assignment following completion of training. The vaccination will not be made available to those employees who have previously received the complete hepatitis B vaccination series, if antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons. Apex will not make prescreening a prerequisite for receiving the vaccination.

The hepatitis B vaccination is a noninfectious, yeast-based vaccination given in three (3) injections to the arm. It is prepared from recombinant yeast cultures rather than human blood or plasma; thus there is no risk of bloodborne pathogen contamination from the vaccine. The vaccination takes six months and more than 90% of those vaccinated will develop immunity to the hepatitis B virus. The vaccination will only be effective if all three (3) injections are received and it is currently unclear how long the immunity lasts, so boosters may be necessary. The vaccine causes no harm to those who are already immune or to those who may be HBV carriers.

Employees who decline to accept the hepatitis B vaccination offered by Apex should sign the **Hepatitis B Vaccine Declination Form** (see Appendices). If an employee initially declines the hepatitis B vaccination, but at a later date while still covered under the standard decides to accept the vaccination, Apex will make available the vaccination. If, at a future date, the U.S. Public Health Service recommends routine booster dose(s) of the hepatitis B vaccine, Apex will provide these boosters as required.

Post Exposure Evaluation and Follow-Up

All exposure incidents will be reported to a EHS specialist immediately following the exposure incident. Site supervisors or Project Managers will notify a EHS specialist of an exposure incident within 24 hours of exposure to potentially infections material.

Following any reports of an exposure incident, Apex will provide the exposed employee with a complete medical evaluation and follow-up. The evaluation will be conducted completely confidential with a Apex approved Occupational Health Physician. The evaluation will include, at least, documentation of route(s) of exposure, circumstances under which the exposure incident occurred, and identification and documentation of the source individual unless this is not feasible or prohibited by state or local law. Apex will provide the Occupational Health Physician with all appropriate circumstances surrounding the exposure incident. The exposed employee will complete the **Exposure Incident Evaluation Form** (see Appendices) and provide this, along with a copy of the OSHA Standard, to the evaluating physician.

The source individual's blood will be tested as soon as feasible after consent is obtained to determine HBV and HIV infectivity. All source consent or non-consent will be documented.

When the source individual is already known to be infected with HBV or HIV, testing will not be repeated. The exposed employee will be provided information on the source individual's test results and will also be informed of applicable laws and regulations regarding disclosure of the source individual's status.

The exposed employee's blood will be tested as soon as feasible after consent is obtained to determine HBV and HIV infectivity. If the employee consents to baseline blood collection, but not HIV serologic testing, the sample will be preserved for 90 days. If, within this time, the employee elects to have the baseline sample tested, the tests should be run as soon as feasible.

Apex's Occupational Health Physician will provide Apex and the effected employee with a written opinion of the evaluation within fifteen (15) days of completion of the evaluation. The written opinion will be limited to whether the hepatitis B vaccination is indicated for an employee and if the employee has received such vaccination, that the employee has been informed of the results of the evaluation and that the employee has been told about any medical conditions resulting from the exposure incident. All other findings should remain confidential between the physician and employee and should not be included in the written report.

Apex and Apex's Occupational Health Physician will provide follow-up evaluations, including counseling and evaluation of reported illnesses as deemed necessary by the evaluating physician.

Communication of Hazard to Employees

Based on the nature of Apex's potential occupational exposure from its routine services, labels and signs are not applicable to communicate the hazard to employees. Instead, Apex will utilize training to educate its employees.

Apex will conduct training for all employees prior to initial assignment to tasks where occupational exposure may occur. The training will be provided at no cost to the employee and during normal work hours.

The training will contain, at a minimum, the following subjects:

- Access to standard;
- General explanation of epidemiology and systems of bloodborne diseases;
- Modes of transmission of bloodborne pathogens;
- Employer's Exposure Control Plan;
- Methods of recognizing tasks that can lead to exposure;
- Use and limitations of engineering controls, work practices, and personal protective equipment;

- Information on HBV vaccine;
- Actions to take in the event of an emergency;
- Incident reporting and medical follow-up;
- Post-exposure evaluation following an incident;
- Signs and labels and/or color coding, and
- Questions and answer session.

Apex will provide training on an annual basis, including updates and modifications as deemed necessary. Apex's CHSO or designee will perform all training. All training will be documented on an **Employee Training Form** (see Appendices).

Record Keeping

Apex will establish and maintain accurate records for each employee with occupational exposure. This will include both medical and training records.

Medical Records

All medical records will be maintained by Apex's Human Resources department. These records will be maintained within the employee's private personnel file and will include the following:

- Name and social security number;
- Copy of hepatitis B vaccination status, including dates of vaccination and any related medical records;
- Copy of all results of examinations, medical testing, and follow-up procedures;
- Employer's copy of healthcare professional's written opinion; and
- Copy of information provided to healthcare professional for evaluation.

All records will be kept private and not disclosed without the employee's written consent. Records will be maintained for at least the duration of employment plus thirty (30) years. The employer shall ensure that all records required by this section shall be made available upon request of employees, Assistant Secretary & the Director for examination & copying. Medical records must have written consent of employee before released. The employer shall comply with the requirements involving transfer of records set forth in 29 CFR 1910.1020(h).

Training Records

All training records will be maintained by Apex's HR department. These records will be maintained in the employee's personal file. The training records will include, at least, the following:

- Dates of training sessions;
- Contents/summary of training sessions;
- Names/qualifications of persons conducting training;
- Names/job titles of attendees.

All training records will be maintained for three (3) years.

Record Availability

Apex will make all records available, upon request, to the Assistant Secretary (OSHA) and the Director (NIOSH and USDHHS). Employee training records will be provided, upon request, to Apex employees, Apex employee representatives, the Director and the Assistant Secretary. Employee medical records will be provided to the subject employee upon request. All record keeping will be conducted in accordance with the Bloodborne Pathogen Standard.

Program Review

An Apex EHS specialist or qualified personnel will perform an annual review of Apex's Bloodborne Pathogen Program. The date of review will be documented.

References

- OSHA 29 CFR 1910.1030, Bloodborne Pathogens Standard

SILICOSIS PREVENTION PROGRAM

There are two million workers exposed annually to air that contains crystalline silica particles. Silica is the second most common mineral in the earth's crust and is a major component of rock, sand and mineral ores. Silica is found in an amorphous or crystalline form. It is the crystalline form of silica that poses the greatest health concern. Hundreds of workers die each year from lung disease caused by inhaling excessive levels of the crystalline portion of silica dust. Apex employees may occasionally work at a job site where there is the possibility of being exposed to crystalline silica.

Inhaling crystalline silica particles is primarily associated with a disabling, nonreversible and sometimes fatal lung disease, Silicosis, in which the silica scars the lung tissue. The scarring will eventually reduce the lungs' ability to extract oxygen from inhaled air. Crystalline silica has also been associated with other lung diseases including bronchitis and tuberculosis and lung cancer. NIOSH has identified crystalline silica as a carcinogen.

Apex personnel may work at construction or project sites where dusty conditions exist due to demolition, vehicular traffic, and concrete saw cutting activities. Inhaled dust may contain crystalline silica particles. Apex has developed this Silicosis Prevention Program to minimize the risk for employee exposure to elevated airborne levels of crystalline silica.

Materials Containing Crystalline Silica

Examples of materials that pose the greatest potential risk for worker exposure are listed below.

NATURAL AND MAN-MADE CRYSTALLINE SILICA CONTAINING MATERIALS

NATURAL MATERIALS	CONSTRUCTION RELATED MATERIALS	MAN MADE PRODUCTS
Sand Coal Dust Soil Drill cuttings Plant material	Concrete Pavement Ceiling tile Portland cement	Paints Abrasives Mineral products Plastic fillers Polishing compounds

Product Safety Information

Products containing crystalline silica are required to have a label indicating so. Machines used in operations involving crystalline silica should also be labeled with warning signs indicating that silica is being used.

MSDSs are required on all materials or products containing hazardous substances that are used at a business in quantities greater than what a consumer would use. If a material or product contains crystalline silica in quantities greater than 0.1%, there should be an MSDS for it. Manufacturers are responsible for obtaining or developing an MSDS for each hazardous chemical they import or produce. Apex and other employers are responsible for ensuring employee access to MSDS for all hazardous materials in the workplace. Workers potentially exposed to crystalline silica should receive the appropriate level of training on health hazards and proper work procedures to minimize exposure (e.g., dust control, wet methods).

Types, Symptoms and Complications of Silicosis

There are three types of silicosis that can result from exposure, depending upon the airborne concentration of crystalline silica to which a worker has been exposed. The types of silicosis include:

- Chronic silicosis, which usually occurs after 10 or more years of overexposure;
- Accelerated silicosis, which results from higher exposures and develops over a 5 to 10 year period; and
- Acute silicosis, which occurs where exposures are the highest and can cause symptoms to develop within a few weeks to five years.

Chronic silicosis is the most common form of the disease and may go undetected for years in the early stages. Chest X-rays may not reveal an abnormality until after 15 or 20 years of exposure. The body's ability to fight infections may be overwhelmed by silica dust in the lung, making workers more susceptible to certain illnesses, such as tuberculosis. As a result, workers may exhibit one or more of the following symptoms:

- Severe cough;
- Shortness of breath following physical exertion;
- Loss of appetite;

- Fatigue;
- Chest pains; or
- Fever.

Medical Examination

A medical examination that includes a complete work history, chest X-ray and lung function test is the method used to determine if a person has silicosis. Apex provides this type of exam to employees upon hire and annually thereafter as part of the employees annual health exam (see Section 9.2). Employees need to be medically qualified to conduct work activities at hazardous waste sites. Apex personnel who believe they are overexposed to silica dust should visit a doctor who specializes in occupational or lung diseases and should have a medical examination that includes:

- Chest X-ray;
- Classification of Pneumoconioses (lung scarring from silica exposure) from X-rays;
- Pulmonary function test; and
- Annual evaluation for tuberculosis.

Apex will provide medical surveillance data to employees participating in a medical surveillance program upon request. A physician or other licensed health professional (PLHCP) will provide each employee receiving a medical exam, a written summary of the findings of the medical examination.

Permissible Exposure Limits for Silica

OSHA regulates that amount of silica dust to which employees may be exposed and has established permissible exposure limits (PEL) for crystalline silica dust. The PEL is dependent upon the amount of crystalline silica that is present in the dust. OSHA places more emphasis on the respirable (crystalline) fraction of dust over total dust because the respirable portion of the dust will lodge in the lungs and be more hazardous to a worker.

For guidance on calculating PELs for projects using silica containing materials refer to the most recent revision of 29 CFR 1910.1000.

Determining Silica Exposure Levels of Employees

Whenever Apex performs work that could expose employees to excessive airborne levels of silica, air monitoring should be conducted. Samples will be collected on the employees using a sampling pump and cyclone assembly, which traps breathable particles from the workplace air. A trained health and safety specialist, such as a certified industrial hygienist (CIH), a certified safety professional (CSP) or other qualified health and safety specialist, will collect the air samples. Samples will be analyzed by a laboratory accredited by the AIHA for performing industrial hygiene samples.

Analytical laboratory results will be maintained at the job site for the duration of the project plus 30 years. Lab results will be discussed with Apex personnel and employees will be provided

copies of air monitoring data upon request. The records will be maintained by the project EHS specialist.

The **Checklist for Employee Silica Exposure Monitoring** (see Appendices) should be completed for Apex projects exposed to crystalline silica containing materials. This checklist will serve as a guide to determine projects are in compliance with the exposure monitoring requirements.

Control Measures to be used at Project Sites

Apex will implement the best possible permanent solution to reduce or eliminate exposure to crystalline silica at our job sites. If such a solution cannot be implemented immediately, temporary control measures will be used until a permanent solution is enacted.

Control Measure - Silica Substitutes

Silica substitutes are the best way to eliminate the silica hazard. This is especially important for sandblasters, where the abrasive blasting is often done outside and in different locations, making it impossible to install an engineering control. OSHA literature has indicated that the most severe silica exposures occur in abrasive blasting.

Eliminating the silica means using a different, safer material in lieu of the silica-containing substance; however, it may not be possible to use a silica substitute in some operations.

Advantages of using a silica substitute include:

- Complete elimination of any health hazard related to silica;
- Eliminates the need to implement or maintain engineering controls;
- Easier to transport because the substitutes are not as dense as silica products; and
- They can be moved from job site to job site.

Disadvantages of using a silica substitute include:

- May be slightly more expensive than silica products;
- These substances are generally not as hard as silica products, which may mean more is needed to be used for the job. This could result in additional waste disposal costs.

Control Measure – Engineering Controls

If silica products should be used, OSHA requires engineering controls to be used wherever possible. This type of control involves a mechanical process to eliminate exposure to silica dust. Some of the controls are listed below:

- Install a water hose to wet down the dust at the point of generation;
- Install local exhaust ventilation;
- During rock drilling, flow water through the drill stem;
- Install dust collection systems onto machines or equipment that generates dust; and
- Use concrete/masonry saws that provide water to the blade.

Control Measure – Work Practices

Apex employees should follow safe work practices to reduce their exposure to airborne silica. If workers know about silica health hazards and understand the severity of its health effects, they will be more likely to do the following:

- Know which work operations can lead to silica exposure;
- Post areas as being "regulated areas" due to the possible presence of crystalline silica;
- Participate in any air monitoring or training programs offered by Apex;
- If possible, change into disposable or washable work clothes at the worksite; shower, where available, and change into clean clothing before leaving the site;
- Do not eat, drink, use tobacco products, or apply cosmetics in areas where there is dust containing crystalline silica;
- Wash your hands and face before eating, drinking, smoking or applying cosmetics outside of the exposure area;
- Implement a housekeeping program, which keeps work areas clean of clutter and other debris and allows employees access to water and other sanitary provisions;
- If using a respirator, do not alter the respirator in any way;
- To use CE positive pressure abrasive blasting type respirators for sandblasting;
- For other operations where respirators may be required, use a respirator approved for protection against crystalline silica-containing dust; and
- If using tight-fitting respirators, do not grow beards or mustaches.

Control Measure – Personal Protective Equipment

PPE is a good option as a temporary control but should be considered the last choice as a permanent control measure. Respirators should be used only when the dust controls cannot keep dust levels below the NIOSH Recommended Exposure Level (REL) of 0.05 mg/m3. Refer to the most recent version of Apex's written Respiratory Protection Program (RPP), section 9.1 of this EHS manual. All employees wearing respirators at a project site should be thoroughly familiar with the requirements of the RPP. Apex's RPP will be reviewed annually with employees during their annual, 8-hour HAZWOPER refresher training session (see Section 14.2).

The OSHA ventilation standard also contains specific respiratory protection requirements for abrasive blasting operations. Refer to the most recent revision of this standard for respiratory protection requirements.

Control Measure – Training

In addition to the control measures previously mentioned, all Apex employees will attend a safety awareness training session, which covers the elements of this Silicosis Prevention Program. Training will also cover the health and safety information found in an MSDS for the crystalline silica.

References

- OSHA 29 CFR 1926.103/1910.134, Respiratory Protection
- OSHA 29 CFR 1910.94, the Ventilation Standard
- OSHA 29 CFR 1910.1000, Air Contaminants, Table Z-3
- TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH 2003.
- OSHA Respirator Information Website: http://www.osha.gov/SLTC/respiratoryprotection/index.html

ERGONOMICS AND BACK SAFETY

The purpose of this Section is:

- To familiarize Apex with potential ergonomic and back safety issues;
- To provide information on evaluating job risk factors;
- To introduce potential preventative options;
- To set forth company guidelines on proper lifting techniques; and
- To introduce computer workstation guidelines.

Job Risk Factors

Musculoskeletal disorders can occur whether working at home, in the office, or in the field. Potential musculoskeletal disorders that Apex personnel could develop may include tennis elbow, carpal tunnel syndrome, and back strains and sprains from tasks such as bailing and sampling monitoring wells, working at computer stations, or moving drums. Musculoskeletal injuries can result in lost work time and even permanent disability therefore it is important to evaluate all work related tasks for potential risk factors.

Evaluating Job Risk Factors

Based on limited available data NIOSH has identified eight job risk factors. These risk factors have been published in literature and are used by NIOSH to evaluate some workplaces. It is important to remember that no regulatory standards or levels have been established.

Job Risk Factors:

- Work Space Features;
- Manual Materials Handling (Lifting);
- Manual Materials Handling (Pushing, Pulling, Carrying);
- Vibration (Whole Body);
- Hand-Arm Vibration;
- Repetition;
- Physical Energy Demands; and
- Thermal Stressors.

Design Principles for Minimizing Ergonomic Problems

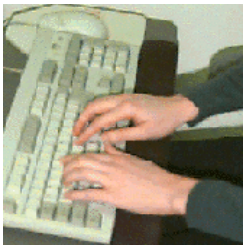
According to NIOSH if certain design principles are implemented during the early stages of developing work processes or job tasks the risk of employees developing work-related musculoskeletal disorders can be reduced and the economic and human costs can be decreased. The following design principles have been identified in reducing associated work related musculoskeletal disorders.

General Workstation Design Principles

- Make workstation adjustable to allow both large and small persons to fit comfortably and reach materials easily;
- Locate materials and tools in front of worker to reduce twisting motions;
- Avoid static loads, fixed postures, and job requirements in which employee should lean to the front or the side, hold a limb in a bent extended position, tilt head forward, and/or support body weight with one leg;
- Keep work above elbow height if task involves fine visual details and below elbow height if downward forces and/or heavy physical effort is required;
- Provide adjustable, properly designed chairs with adjustable seat heat, adjustable up and down back rest, padding that will not compress more than 1 inch under weight of individual, and a stable base;
- Provide floor mats or padded surfaces for prolonged standing and allow workers to alternate between standing and sitting;
- Use gravity to move materials;
- Design primary work area so that arm movements pivot about the elbow rather than the shoulder to avoid stress on shoulder, neck and upper back; and
- Eliminate or minimize undesirable environmental conditions (excessive noise, heat, cold etc.).

Design Principles for Repetitive Hand and Wrist Tasks

- Reduce the number of repetitions per shift;
- Maintain neutral wrist positions by designing jobs and selecting tools that reduce extreme flexion (forward/backward) or deviation (side-to-side) movement of the wrist and avoiding inward and outward rotation of the forearm when the wrist is bent to minimize elbow disorders like tennis elbow;



- Reduce the force or pressure on wrists and hands by reduce the weight and size of object that should be handled repeatedly if possible, avoiding tools that crease pressure in the base of the palm, avoiding repeated pounding with the base of the palm; and avoiding repetitive, forceful pressing with the finger tips;
- Design tasks for a power grip (whole hand) rather than a finger pinch grip;

- Provide support devices where awkward body postures should be maintained;
- Select power tools and equipment that control or limit vibration transmission to hands;
- Provide protection for the hands if working in cold environments; and
- Select and use properly designed hand tools and gloves.

Hand Tool Use and Selection Principles

- Avoid bending or rotating wrists – bend the tool not the wrist;
- Reduce weight and size of tool – do not raise or extend elbows when working with heavy tools;
- Reduce grip force requirements by using compressible gripping surfaces;
- Select tools that use full-hand grip rather than precision finger grip;
- Avoid sharp edges and pinch points;
- Avoid repetitive trigger-finger actions;
- Isolate hands from heat, cold, and vibration; and
- Wear properly fitting gloves.

Design Principles for Pushing, Pulling and Carrying Tasks

- Eliminate the need to push or pull by using mechanical aids (forklifts, slides or chutes etc.);
- Reduce force required by reducing weight of load, using four wheel truck or dollies;
- Reduce the weight of the object being carried;
- Reduce the bulk of the material that are being carried;
- Reduce the distance of the push, pull, or carry;
- Optimize the technique of the push or pull by providing variable-height handles, replacing a pull with a push when possible; and
- Convert a carry to a push or pull when possible by using hand trucks and push carts.

Safe Lifting Practices

Of the almost 2 million disabling injuries incurred on the job in the United States each year, 23 percent are back injuries. In addition, for each one of these workplace back injuries, over two others happen at home or at play.

Occupationally related back injuries cost employers almost $7 billion a year. The results of a back injury are also felt in decreased production, personnel turnover, decreased employee mobility, and general employee pain.

Proper Lifting Techniques

Back injuries can be avoided by following the simple proper lifting techniques described below. In order to safely lift and move an object plan your job and path ahead, look for potential obstacles and determined the most direct route. Also, remember to get help or special equipment if you need to lift more than 70 pounds or if the items are bulky. Whenever feasible, lighten the load by dividing the weight into smaller more manageable portions.

Safe Lifting Procedures

- Establish firm footing and keep feet approximately should width apart;
- Bend at the knees not the waist and try to maintain the spine's three natural curves;
- Keep stomach muscles tightened to help support the spine during lifting;
- Lift with the legs not the back;
- Keep the load close to the body; the closer the load is to the spine the less force exerted on the back;
- Keep back upright when lifting or placing an object; and
- Don't twist body during the lift; move feet and turn.

Computer Workstation Guidelines

Many Apex employees routinely use computers as part of their work duties. During extended use of a computer, musculoskeletal disorders can develop. Apex has provided the following OSHA guidelines for our employees, which will help to prevent these types of disorders from occurring.

Working Conditions

Employee workstations should be arranged to allow work to be done in a comfortable manner. The employee should be working with their head and neck in an upright position. The head, neck and trunk should not be twisted and should be facing forward. The trunk should be nearly at a right angle to the floor. Employees should constantly lean forward or backward in their chair.

The upper arms and shoulders should also be perpendicular to the floor. Arms should be relaxed and not elevated or stretched forward. The upper arms and elbows should not be extended outward and should remain close to the body. Forearms, wrists and hands should be straight and parallel to the floor. The wrists and hands need to be maintained in a straight position and not bent up, down or sideways.

The thighs should be nearly parallel to the floor and the lower legs about perpendicular to the floor. If a person is short, their feet should be supported by a stable footrest. Otherwise, feet should rest flat on the floor.

Video display terminal (VDT) tasks should be organized so that employees can vary VDT tasks with other work activities. Employees should also take micro-breaks or recovery pauses while working at the VDT workstation.

Seating

The backrest of the chair should provide support for employee's lower back. The seat width and depth of the chair should comfortable accommodate the employee. The seat pan should not be too big or too small for the employee. The seat front should not press against the back of the employee's knees and lower legs. The seat should be cushioned and rounded and not have any sharp edge, which could cut off the blood circulation going through the legs. The chair should have armrests that support both forearms while the employee performs VDT tasks and does not interfere with movement.

Keyboard/Input Device

The keyboard/input device platform should be stable and large enough to hold keyboard and input device. The mouse or trackball input device should be located adjacent to the keyboard so that it can be operated without overextending the arm. The input device should be located on the right side for a right-handed person and on the left side for a left-handed person. The input device should be easy to activate and its shape and size should fit comfortably in the hand of the employee. The employee's wrists or hands should not rest on sharp or hard edges. Wrist rests should be used, when such situations exists. Routinely resting the wrist or hand on a sharp edge can lead to ergonomic-related disorders.

Monitor

The top line of the screen of the monitor should be at or below eye level so that the employee can comfortably read the line without bending the head or neck forward or backward. If an employee wears bifocals or trifocals, the individual should be able to read the screen without bending their head or neck backward. The monitor should be placed to allow employees to read the screen without leaning the head, neck or trunk forward or backward. The monitor should be positioned directly in front of the employee so that the twisting of the head or neck is avoided. No glare from lighting sources should be present on the screen. Glare may cause employees to assume an awkward posture to read the screen.

Work Area

The work area should be designed or arranged for doing VDT tasks so that the employee's thighs have adequate clearance space between the chair and the VDT table/keyboard platform. The employee's legs and feet should have clearance space under the VDT table to enable the employee to get close enough to the keyboard/input device to type in a comfortable manner.

Accessories

If an employee uses a document holder, it should be stable and large enough to hold the documents being viewed. The document holder should be positioned about the same height and distance as the monitor screen. This will minimize head movement when the employee looks from document to screen.

If a wrist rest is provided, it should be padded and free of sharp and square edges. The wrist rest should allow the employee to keep forearms, wrists and hand straight and parallel to the ground when typing, using a mouse or trackball.

Telephones should be placed on the right side for a right-handed person and on the left side of the workstation for a left-handed person. The telephone should be positioned so that the employee does not overextend the arm when reaching for the phone. The telephone should be used with head upright, not bent, and shoulders relaxed and not elevated if the employee does VDT tasks simultaneously. In such cases, a telephone headset may be more appropriate for employees.

General

Workstation and equipment should have sufficient adjustability so that the employee is able to maintain a safe working posture and can make occasional changes in posture while performing VDT tasks. All VDT associated equipment should be maintained in serviceable condition and function properly.

References

- EM 385-1-1: Safety and Health Requirements Manual, US Army Corps of Engineers, September 3, 1996.
- NIOSH Elements of Ergonomics Programs: http://www.cdc.gov/niosh/ephome2.html#second

BIOLOGICAL (INSECT, PLANT AND ANIMAL) HAZARDS

Environmental factors such as animals, insects, and irritant plants may pose a hazard when performing work outdoors. The following subsections describe specific biological hazards that Apex employees may encounter.

Insects

Apex personnel should be familiar with hazard identification, prevention, and control as it relates to biting/stinging insects. There are a variety of biting/stinging insects that may be encountered at the job sites, as listed below:

- Ticks;
- Mosquitoes;
- Wasps, bees, hornets and yellow jackets;

- Spiders; and
- Mites/chiggers.

Ticks

Heavily vegetated areas of the job site may have ticks. It is required that all personnel walking through such areas observe proper tick precautions that may include performing periodic body checks and taping ankles of pant legs prior to beginning work. Personnel may also want to spray clothing and skin with repellants just before going into the field. Use insecticides containing permethrin for the clothes and DEET for the skin. Tyvek suits or light-colored clothing are also helpful to spot ticks before they become attached to the body.

Ticks can transmit several diseases, including Lyme Disease, Babesiosis, Ehrlichiosis, and Rocky Mountain Spotted Fever. Ticks adhere strongly to the skin or scalp. If you identify a tick attached to your skin or scalp, notify the EHS specialist and seek medical attention. A health care professional or local health department may want to examine the tick. Wash the bite area with soap and water.

If a tick has attached itself to your body, carefully grasp the tick as close to the skin as possible and pull straight out, without twisting. Place the tick in a closed container and save it in case an infection results.

Lyme Disease

Lyme disease is the most recognized tick-borne illness. The disease is transmitted by ticks who have fed on certain deer and mice. These ticks are found throughout the United States. The peak tick season is May though September. The areas of highest risk are the Northeast, Great Lakes Region, and an area in Northern California. Current scientific estimates indicate that the disease is transmitted after the tick has attached to the individual for 6 to 24 hours. Between 15 and 30 % of ticks are infected. The longer the tick is attached, the greater the probability of infection.

Early signs and symptoms of Lyme disease (3 - 32 days after tick bite) include a characteristic “bulls-eye” (red, circular) rash at the site of the tick bite (see adjacent figure); fever; headache; fatigue; muscle and joint pain; and swollen glands.

Later Signs and Symptoms of Lyme disease (6 to 9 months after tick bite) include: weak facial muscles, stiff neck, irregular heart beat, numbness, loss of appetite, dizziness, persistent fatigue, and double vision.

Babesiosis

Babesiosis is transmitted by ticks that typically have been infected by rodents, cattle, or wild animals. These ticks are most commonly found in the Northeastern, Pacific Coast, and Upper Midwestern portions of the United States.

Early Signs and symptoms of Babesiosis (1 to 9 weeks after tick bite) include fever, chills, profuse sweating, fatigue, dark-colored urine, nausea, abdominal pain and enlarged spleen.

Ehrlichiosis.

Ehrlichiosis is transmitted by deer ticks and the Lone Star tick. Peak cases are from May to July and October to December. The first known cases were described in 1987. Reported incidences have occurred in individuals over 40 years old. The most prevalent areas of the country are the Southern and Northeastern areas of the United States.

Early signs and symptoms of Ehrlichiosis (5 to 11 days after tick bite) include: rapid onset of fever, acute headache, non-specific rash (usually lower part of body), shaking chills, generalized tired feeling, muscle and joint pain, cough, and vomiting.

Rocky Mountain Spotted Fever

The states with the highest incidence of the Rocky Mountain Spotted Fever are North Carolina and Oklahoma. Fifty percent of the infections occur in the South-Atlantic region of the United States. The Pacific and West-South Central regions also have cases. More than 90 % of the patients with Rocky Mountain Spotted Fever are infected between April and September.

Early signs and symptoms of Rocky Mountain Spotted Fever (3 to 4 days after tick bite) include fever, nausea (feeling sick to the stomach), severe headache, muscle pain and loss of appetite.

Later signs and symptoms of Rocky Mountain Spotted Fever include rash (wrists, forearms, and ankles), abdominal pain, joint pain and diarrhea.

Mosquitoes

In the US, mosquitoes are responsible for West Nile Virus. The West Nile Virus is primarily a disease of birds. It is commonly found in Africa, West Asia, and the Middle East, but has also caused outbreaks in Europe. In humans, it can cause encephalitis, an infection of the brain. West Nile Virus is similar to the virus that causes St. Louis encephalitis, which for years has been found in the United States. Humans get the West Nile Virus largely from the bite of mosquitoes. The female mosquito catches the virus when it bites an infected bird, then if it bites a human passes it along. Humans do not get it from other humans or animals.

Symptoms of West Nile Virus

Most people infected by the West Nile Virus have no symptoms at all, or experience something that feels like flu. Symptoms of “West Nile Fever” may include fever, headache, achy muscles,

and extreme tiredness, perhaps with skin rash and swollen lymph glands. In a fraction of cases, the fever leads to encephalitis, which may cause neurological effects and is fatal in some cases. There is no vaccine against West Nile, and no known "cure." As with other viral diseases, treatment consists of support until it has run its course. The incubation period — the time between an infectious bite and the onset of symptoms — is usually 5-15 days.

Techniques to Avoid Mosquitoes

- Empty standing water in old tires, buckets, plastic covers, or any other container;
- Use mosquito repellents when necessary and follow label directions and precautions closely;
- Use head nets, long sleeves, and long pants if you venture into areas with high mosquito populations, such as salt marshes;
- If there is a mosquito-borne disease warning in effect, stay inside during the evening when mosquitoes are most active;
- Make sure window and door screens are "bug tight"; and
- Replace outdoor lights with yellow "bug" lights.

Wasps, Bees, Hornets, and Yellow Jackets

Wasps, bees, hornets and yellow jackets are venomous insects whose stings produce a variety of symptoms ranging from minor pain and swelling to fatal allergic reactions. Honey bees have barbed stingers that usually remain in the sting hole. Honey bees can only sting once. Wasps do not have barbed stingers and can sting repeatedly. Generally, wasps are more aggressive than honey bees. Africanized honey bees resemble our familiar European honey bees but are much more aggressive. Africanized bees are dangerous because their victims may be stung by thousands of bees sent out in defense of the hive. Africanized bees are NOT more poisonous than European bees and their stings are treated the same way as are the stings of European bees. To the naked eye, Africanized bees are indistinguishable from European bees.

Example of a Honey Bee

Example of a Wasp

A yellow jacket wasp.

Avoiding Stings

Wasps and bees often fly, unnoticed, into soft drink cans, resulting in painful stings of the lips, tongue and mouth. Bees are attracted to flowering plants; certain colors also appear to attract bees and wasps. Blue clothing in particular seems to be associated with more unprovoked stings. Threatening a hive by approaching too closely or by making loud noises or vibrations often results in multiple stings.

Be alert for signs that a hive has been started in your area. Increased bee activity may be a sign that there is a hive nearby. Seal all areas that may be small enough for bees to enter. When working with heavy equipment remember that the equipment's vibration may provoke an attack. If attacked, cover your face with your arms and run away from the hive or away from the direction from which the bees are attacking. The bees do not fly fast and most people can outrun them. If you are working with heavy machinery and the cab of the vehicle is sealed then stay inside and drive out of the area. Don't drive toward unprotected co-workers. If the vehicle is unsealed, turn off the vehicle and run for indoor shelter. A car will also provide good shelter. Put the air conditioner in the car on high as cold air will slow the bees that will have pursued you into the car. If you see someone being attacked call 911. Direct the victim toward shelter, but don't approach them. Anyone who suffered a large number of stings needs to be seen by a physician immediately. Anyone who has 50 or more stings should receive treatment in an emergency room, as should anyone with severe symptoms such as difficulty breathing or loss of consciousness.

Effects of stings

Bee and wasp stings produce similar effects. There are 3 patterns of symptoms seen following stings.

- **Local Effects**: These symptoms begin immediately after the sting. Typically, the area around the sting is pale and is surrounded by redness. The stinger may still be present. The pale area may quickly turn into a red welt. The sting is usually painful, but the pain usually improves in minutes. There may be a great deal of swelling. Swelling may be delayed for 5 or 6 hours after the sting. Usually hands and feet swell more than stings to the chest or abdomen. Local swelling, even dramatic swelling, is normal and not a sign of allergy. Swelling often takes 3-4 days to resolve. Bruising and itching often are associated with this swelling. Bee and wasp stings can become infected and therefore, all sting sites should be washed with soap and water. Signs of infection include a red streak running up the extremity, fever or any discharge from the sting. Infection requires prompt medical attention.

  All personnel who are allergic to bee or other flying insect stings should consult their physicians and carry medicines and antidotes to treat allergic reactions. Those who know they are allergic to stings should inform everyone on the project site and develop contingency plan for a bee attack.

- **Allergic Reactions:** Bee sting allergy produces sudden severe symptoms that usually occur within minutes following a sting. Signs of a severe reaction include flushing and anxiety, which are almost always present. Facial swelling, especially around the lips and eyelids may be present. The victim may have difficulty breathing, feel as if the throat is closing, or may lose consciousness. These symptoms require emergency action.

Telephone 911 to summon paramedics and help the victim to use a bee sting kit if one is available.

- **Toxic Reactions**: Multiple bee stings can cause the above reactions, but also additional, unique problems. Shock may occur if the victim has suffered hundreds of stings. Delayed symptoms are common and range from nausea and vomiting, common after even a few stings, to destruction of red blood cells and kidney failure which occurs with large numbers of stings. Anyone who has suffered more than 5 stings should consult their doctor. Anyone who has suffered more than 50 stings needs emergency room care.

First Aid For Stings:

Many remedies recommended in the past have been shown to be useless, or to actually be dangerous.

FIRST AID FOR STINGS

DOs:

DO remove the stinger if present. Scrape it out with a credit card or fingernail.
DO wash stings with soap and water.
DO apply an ice pack for 5 to 15 minutes. Be careful not to freeze the skin.
DO telephone 911 to summon paramedics if the victim is having an allergic reaction and use a bee sting kit as prescribed.
DO treat swelling by elevating the swollen body part above the heart.

DON'Ts:

DO NOT squeeze the sting, or rub mud into it. This increases the risk of infection.
DO NOT apply meat tenderizer or baking soda. These don't help and can actually cause problems.
DO NOT administer electrical shocks or drugs not prescribed for the patient.

Spiders

There are several poisonous spiders in the U.S. including:

- Brown recluse, also known as violin or fiddle spider;
- Black widow;
- Tarantulas; and
- Hobo spider also known as aggressive house spider.

The most poisonous of these, the brown recluse spiders and black widow spiders, are described below.

Brown Recluse Spider

Brown Recluse Spider

The brown recluse has long, skinny legs and is about one-half inch long overall. Its entire body is brown, except for a dark mark in the shape of a violin on its head. Its poisonous relatives may be gray, orange, reddish-brown, or pale brown.

Brown recluse spiders are most commonly found in Midwestern and Southern states of the U.S., and they usually hang out in dark places. When they are outside, they like to spend time in piles of rocks, wood, or leaves. If they come inside, brown recluse spiders will go to dark closets, attics, or basements. They are non-aggressive and bite only when disturbed. A person who gets bitten by a brown recluse spider may not notice anything at first or only feel a little sting at first. After about 4 to 8 hours, the sting will start to hurt a little more. It might look like a bruise or might form a blister surrounded by a bluish-purple area that turns black or brown and becomes crusty after a few days.

Brown recluse spider bites rarely kill people, but it's important to get medical attention as soon as you can because they can make you very sick. Wash the bite well with soap and water. You can also apply ice to the area, elevate it, and keep it still. If possible, catch and bring the spider to the doctor's office with you - this is important because it can be difficult to diagnose a spider bite correctly. The spider can be killed first before you bring it with you; just be sure not to crush it so much to make it unidentifiable.

Black Widow

Black Widow Spider

The black widow spider has a body that is about one-half inch long (smaller than a dime), and it has long legs. The black widow spider is shiny and black with a red-orange or yellow mark in the shape of an hourglass on its stomach.

Black widow spiders and their relatives can be found almost anywhere in the Western hemisphere of the world in damp and dark places. Their favorite places are wood piles, tree stumps, trash piles, storage sheds, fruit and vegetable gardens, in stone walls, and under rocks. If they come inside, they will go to dark places like corners of closets, garages, or behind furniture. They are shy by nature and bite only when trapped, sat on, or accidentally touched

A person who gets bitten by a black widow spider might not know it right away, since the bite can sometimes feel like a little pinprick. After 30 to 40 minutes, though, the area of the bite will swell and hurt. Black widow spider bites rarely kill people, but it's important to get medical

attention as soon as you can because they can make you extremely sick. Wash the bite well with soap and water. Then apply an ice pack to the bite to slow down the spread of the spider's venom. Try to elevate the area and keep it still to help prevent the spread of venom.

> Signs and Symptoms for most spider bites include bite marks, swelling, pain, nausea and vomiting, and difficulty breathing or swallowing.

If possible, catch and bring the spider to the doctor's office with you. Even though it's usually easy to identify black widows, you'll want to make sure that's the kind of spider that bit you. The spider can be killed first before you bring it with you; just be sure not to crush it so much to make it unidentifiable.

> Treatment for most spider bites entails: washing the wound, applying a cold pack, getting medical care to receive antivenin, and calling an Ambulance, dialing 911 or a local emergency number, if necessary.

Mites/Chiggers

Chiggers are the larvae of harvest mites. Chiggers feed on low vegetation, but they need animals as a source of protein. Chiggers do not burrow into the skin; instead they attach themselves to the opening of a hair shaft and inject saliva into the skin. When on a person, chiggers go to areas where the skin is thin and moist: the ankles, wrists, thighs, groin or waist. The mite stays in this area until feeding is complete. This time span can be anywhere from 1 to 4 days. After feeding, the larvae drop back to the ground to complete their development. In some people, the initial bite can trigger an allergic response and a rash may appear on surrounding areas of skin. If you walk through a wooded or grassy area, it is possible to be attacked by chiggers. People get chiggers simply by the mites jumping onto the skin.

Methods of Prevention:

- If possible, avoid walking through low brush or woody areas;
- If you have to go into an area infested with chiggers, make sure all of your skin is covered with clothing; and
- Apply an insect repellent containing the substance dimethyl phthalate to areas of the body that are not covered by clothing. Also apply the repellent to areas where clothing overlaps such as the ankles. A tick repellent named Duranon is an effective method for keeping chiggers off of you. It should only be applied to your clothing. Avoid contact with your skin.

Poisonous Plants

Plants such as Poison Ivy, Poison Oak, and Poison Sumac and may be prevalent at the job site during certain times of the year. Skin inflammation or dermatitis may result from contact with the milky sap (urushiol) found in the roots, stems, leaves, and fruit of these and

similar plants. Symptoms first arise from a few hours to several days after contact.

Symptoms of exposure to poisonous plants include:

- Itching, redness. burning sensation, and swelling;
- blisters which may rupture and ooze liquid and subsequently crust over; and
- Rash which may take up to 10 days to heal.

Prevention/Control of exposure to poisonous plants include:

- Wear long-sleeved shirts and long pants, tucked into boots. Wear cloth or leather gloves;
- Apply barrier creams to exposed skin;
- Educate workers on the identification of poison ivy, oak, and sumac plants;
- Educate workers on signs and symptoms of contact with poisonous ivy, oak, and sumac; and
- Keep rubbing alcohol accessible. It removes the oily resin up to 30 minutes after exposure.

Poison Ivy

Poison ivy grows everywhere in United States except Hawaii and Alaska. In the East, Midwest, and the South, it grows as a vine. In the Northern and Western United States, it grows as a shrub. Each leaf has 3 leaflets. Leaves are green in the summer and red in the fall. In the late summer and fall, white berries may grow from the stems.

Poison Oak

Oak-like fuzzy leaves in clusters of 3. It has 2 distinct kinds: Eastern poison oak (New Jersey to Texas) grows as a low shrub. Western poison oak (Pacific Coast) grows to 6-foot-tall clumps or vines up to 30 feet long. It may have clusters of yellow berries.

Poison Sumac

Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. Each leaf has clusters of 7 to 13 smooth-edged leaflets. The plants can grow up to 15 feet tall. The leaves are orange in spring, green in summer and red, and orange or yellow in fall. There may be clumps of pale yellow or cream-colored berries

To prevent contracting dermatitis, skin protection is important. All areas of the skin should be protected.

Chemical-resistant gloves should be used to protect hands. Frequent skin washing with soap is helpful. TecnuTM Poison Ivy Cleanser may be effective, particularly immediately after skin contact. Workers will be trained during tailgate safety meetings and as part of periodic safety briefings to recognize these plants and to minimize contact.

Wild Animals

During job site operations such as well sampling, wild animals such as rabbits, birds, stray dogs or cats, raccoons, mice, and snakes may be encountered. Workers should use discretion and avoid all contact with wild animals. If these animals present a potential problem, efforts will be made to protect workers and/or remove these animals from the job site.

Be especially aware of animals that are acting erratically or are frothing at the mouth, as this can be a sign that animal has rabies. In addition, some snakes are poisonous and can inject potentially lethal venom when they bite. Signs and symptoms of a poisonous snakebite include 1 to 2 punctures made by the hollow fangs. Pain following within 5 to 10 minutes accompanied by swelling and discoloration around the bite area. These symptoms will progress up the victim's extremity. If the fang enters a vein or artery, these symptoms may not be present. Recommended first aid steps consist of washing the wound, keeping the bitten part still, and lower than the heart, and call **911 immediately.**

References

- Poison Control Hotline (800) 222-1222
- USEPA Hotline (800) 424-9346
- Centers for Disease Control (800) 311-3435
- Emergency Snake Hotline (718) 430-6494
- U.S. Public Health Service http://www.hhs.gov
- U.S. Fish & Wildlife http://offices.fws.gov/phone.html
- U.S. Army Corps of Engineers http://www.usace.army.mil
- OSHA – All Regions http://www.osha.gov/html/RAmap.html

AIR MONITORING PROGRAM

The purpose of an Air Monitoring Program is to determine the airborne hazards present at each job site and to outline the air monitoring/ personnel exposure limits to be followed during work activities.

This Monitoring Program describes the primary air quality issues that Apex encounters: organic vapors, combustible gases, and low/high oxygen levels.

Other airborne contaminants can be present at Apex job sites (For example, airborne lead, arsenic, asbestos); site specific Air Monitoring Plans should be developed for each Apex project. For a site specific Air Monitoring Plan, Apex EHS specialists should identify the types of air contaminants present at the site, their highest measured concentrations, vapor pressures, exposure limits, and combinations of these values. Only then can appropriate monitoring and PPE selection take place.

Apex Air Monitoring Plans entail both real time data collection and personal monitoring of workers at the job site. Exposure guidelines are set by project EHS specialists and are intended to provide maximum protection to workers while still allowing effective task completion.

Real Time Monitoring

The following real time air monitoring instruments will be available for use during operations:

Flame Ionization detector (FID), and

O_2/LEL meter (Combustible gas indicator (CGI) with oxygen (O2) sensor).

An example of an O_2-combustible gas meter.

Site worker operating an FID.

Instrument calibration should be documented and included in a field EHS logbook. All instruments should be calibrated before each daily use in accordance with the manufacturer's specifications. Manufacturer's literature, including operations manual for each piece of monitoring equipment, will be maintained on-site by a project EHS specialist for reference.

Organic vapor concentrations should be measured using the FID whenever a remediation system is open or if organic vapor exposure is possible. Organic vapor concentrations should be measured outside of the work area(s) to determine the work area background concentrations prior to beginning work area activities. Organic vapor measurements will be conducted during remediation system startup; operation and maintenance; and prior to and during handling of contaminated materials. The monitoring for organic vapors should consist of measurements recorded at breathing zone (BZ) height (the area of highest employee exposure risk). When working outdoors, the wind direction will be considered and air monitoring results will be qualified as up-wind, down-wind, or perimeter samples. The project EHS specialist will evaluate monitoring results using professional judgment, OSHA regulations and other published exposure guidelines. Air monitoring results will be recorded on the Air Monitoring Form (see Appendices).

Others methods of chemical detection and air monitoring may be identified and implemented by the project EHS specialist.

An O_2/LEL meter should be used to monitor for combustible gases and oxygen content in confined spaces and during activities when the Level B Action Level for organic vapors is exceeded. Oxygen, combustible gas, and organic vapor readings will be collected in that order prior to confined space entry activities and on at least 15-minute intervals.

If the air monitoring indicates abnormal conditions or the Site EHS Officer feels that an imminent health hazard exists, work at that location should be terminated and personnel should be

evacuated to a predetermined location upwind from the area. Apex project managers and clients should be notified immediately and work should not resume until appropriate corrective action measures are implemented.

Personal Air Monitoring

Personal Integrated Air Monitoring

The assessment and evaluation of personnel exposure to airborne contaminants will be made by the project EHS specialist in coordination with the other qualified Apex personnel. The assessment and evaluation will compare results with current OSHA permissible exposure limits (PELs), and ACGIH threshold limit values (TLV), for 8-hour time-weighted averages (TWA), short term exposure limits (STEL), and/or ceiling limits. Area samples may be collected, but some samples should be personal samples collected in the workers' BZs. Monitoring may be conducted to assess the exposure potential of some specific work activities on a periodic basis.

All sampling pumps will be pre- and post-calibrated with either a primary or calibrated secondary standard. A separate log should be kept detailing calibration information. Air monitoring results will be recorded and posted for personnel inspection on the **Air Monitoring Form** (see Appendices) and will be discussed during daily safety briefings.

Special testing and monitoring may be conducted at the discretion of the project EHS specialist to document unusual operations or operations suspected of releasing Site contaminants.

Organic Vapor Personnel Monitoring

Organic vapor personnel monitoring may be performed periodically to establish and ensure personnel exposures are maintained within acceptable levels. Sampling during maintenance may also be performed to determine the need for additional engineering controls, and to evaluate the adequacy of PPE.

Consideration should be given to collecting personal samples whenever systems are opened that may result in exposure to organic vapors, especially for non-routine tasks.

The frequency and number of samples collected will be sufficient to evaluate compliance with established exposure limits. EHS specialists should determine the frequency and number of samples. Consideration should be given to each site's work status, results of real-time monitoring, and expected activities.

Analysis of personal sampling should be performed for the compounds that pose the greatest risk. All routine, on-site air monitoring should be performed using an FID, or a photoionization detector (PID) with a lamp with an eV rating greater than the ionization potential of the airborne contaminant. To effectively monitor for a wider range of potentially harmful compounds, the instrument of choice for real-time monitoring is an FID which has been a reliable tool for measuring total organic vapors.

The various action levels, PELs, and ceilings for the organic compounds potentially released when a system is open are relatively low. Detection and measurement of individual compounds requires use of colorimetric detector tubes or compound-specific PIDs for each specific compound. EHS specialists will determine if compound-specific air monitoring is necessary, and if a particular job site is suitable for a compound specific air monitoring program.

In addition to routine, real-time air-monitoring with an FID during any on-site activity, the project EHS specialist may perform routine or non-routine periodic air sampling for specific compounds during any of the various activities that take place at a job site.

The sampling methods and analyses will be NIOSH or OSHA approved. Alternate methods and/or analytes may need to be proposed to clients or governing bodies before sampling begins. Sample analysis should be performed by an AIHA approved laboratory.

General Procedures

General personal monitoring procedures to be followed include:

- Selection of high-risk individuals who are thought to have the highest exposure, based on job assignment and observations of the project EHS specialist;
- Air sampling pumps used to collect employee exposure samples should be calibrated before and after each day of use. Calibration should be accomplished using a primary standard calibration system (e.g., electronic calibrator). Results of the calibrations should be included in the field EHS logbook and with Air Monitoring Forms and employee exposure reports;
- Analysis of samples collected for assessment of employee exposures should be performed only by analytical laboratories accredited by the AIHA; and
- Results of the personal exposure assessment should be provided to the individual within five (5) working days after receipt of laboratory reports. Reports to field personnel should provide calculated TWA exposures and should provide comparative information relative to established exposure limits. The air sampling data sheet and laboratory report should be included in Apex project files. The results will also be posted for site workers to view.

Quality Assurance/Quality Control

The quality control for the off-site analysis of personal monitoring samples will consist of 10% duplicate air samples being collected and analyzed. Blank samples will be analyzed at a frequency of one per batch. It will be the project EHS specialist's responsibility to collect all samples as directed by OHSA, NIOSH, or another governing body.

At a minimum, the quality control program will include the following:

- Calibration procedures;
- Recordkeeping;

- Training of field personnel;
- Data quality assessment;
- Chain of custody; and
- Auditing procedures.

References

- 29 CFR 1910 Subpart Z, Permissible Exposure Limits for Toxic Substances
- 29 CFR 1910.1000, Air Contaminants, Table Z-3
- TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH 2003.

LEAD SAFETY AWARENESS PROGRAM

Lead has been poisoning workers for thousands of years. In the construction industry, traditionally most over-exposures to lead have been found in the trades, such as plumbing, welding and painting.

In building construction, lead is frequently used for roofs, cornices, tank linings, and electrical conduits. In plumbing, soft solder, used chiefly for soldering tinplate and copper pipe joints, is an alloy of lead and tin. Soft solder, in fact, has been banned for many uses in the United States. The use of lead- based paint in residential application has also been banned by the Consumer Product Safety Commission. However, since lead- based paint inhibits the rusting and corrosion of iron and steel, it is still used on bridges, railways, ships, lighthouses, and other steel structures, although substitute coatings are available.

Significant lead exposures can also arise from removing paint from surfaces previously coated with lead-based paint, such as in bridge repair, residential renovation, and demolition. With the increase in highway work, including bridge repair, residential lead abatement, and residential remodeling, the potential for exposure to lead-based paint has become more common. The trades potentially exposed to lead include iron work, demolition work, painting, lead-based paint abatement work, plumbing, heating/air- conditioning work, electrical work, and carpentry/renovation/remodeling work.

Operations that generate lead dust and fume include the following:

- Flame-torch cutting, welding, the use of heat guns, sanding, scraping and grinding of lead painted surfaces in repair, reconstruction, dismantling, and demolition work;
- Abrasive blasting of bridges and other structures containing lead-based paints;
- Use of torches and heat guns, and sanding, scraping, and grinding lead-based paint surfaces during remodeling or abating lead-based paint; and
- Maintaining process equipment or exhaust duct work.

The employer of construction workers is responsible for the development and implementation of a worker protection program in accordance with 29 CFR 1926.20 and 29 CFR 1926.62(e). This program is essential in minimizing worker risk of lead exposure. Construction projects vary in their scope and potential for exposing workers to lead and other hazards. Many projects may involve limited exposure, such as the removal of paint from a few interior residential doors.

The most effective way to protect workers is to minimize exposure through the use of engineering controls and good work practices. It is OSHA policy that respirators are not to be used in lieu of engineering and work practices to reduce employee exposures to below the PEL. Respirators can only be used in combination with engineering controls and work practices to control employee exposures. The respirator shall be used during the time period necessary to install or implement engineering or work practice controls, where engineering and work practice controls are insufficient and in emergencies.

OSHA's standard for lead in construction limits worker exposures to 50 micrograms of lead per cubic meter of air averaged over an eight-hour workday.

At the minimum, the following elements should be included in the employer's worker protection program for employees exposed to lead:

- Hazard determination, including exposure assessment;
- Engineering and work practice controls;
- Respiratory protection;
- Protective clothing and equipment;
- Housekeeping;
- Hygiene facilities and practices;
- Medical surveillance and provisions for medical removal;
- Training;
- Signs; and
- Recordkeeping.

To implement the worker protection program properly, the employer needs to designate a competent person, i.e., one who is capable of identifying existing and predictable hazards or working conditions which are hazardous or dangerous to employees, in accordance with the general safety and health provisions of OSHA's construction standards. The competent person must have the authorization to take prompt corrective measures to eliminate such problems.

Qualified medical personnel must be available to advise the employer and employees on the health effects of employee lead exposure and supervise the medical surveillance program.

Personal Protection Equipment (PPE)

At no cost to employees, employers must provide workers who are exposed to lead above the PEL and for whom the possibility of skin contamination or skin or eye irritation exist, clean, dry protective work clothing and equipment. Appropriate changing facilities must also be provided.

Appropriate protective work clothing and equipment used on construction sites can include:

- coveralls or other full-body work clothing;
- gloves;
- vented goggles or face shields with protective spectacles or goggles; and

Disposable coveralls and separate shoe covers may be used, if appropriate, to avoid the need for laundering. Non-disposable coveralls shall be replaced daily. If an employee leaves the work area wearing protective clothing, the clothing should be cleaned with high-efficiency particulate air (HEPA) filter vacuum equipment to remove loose particle contamination; or as an alternative, the coveralls should be removed. Before respirators are removed, HEPA vacuuming or other suitable method, such as damp wiping, shall be used to remove loose particle contamination on the respirator and at the face-mask seal. Use work garments of appropriate size, and use duct tape to reinforce their seams (e.g., underarm, crotch, and back).

Contaminated clothing that is to be cleaned, laundered or disposed of shall be placed in closed containers. Containers shall be labeled with the following warning:

CAUTION: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead- contaminated wash water in accordance with applicable local, state, or federal regulations.

Persons responsible for handling contaminated clothing shall be informed of the potential hazard in writing. At no time shall lead be removed from protective clothing or equipment by any means that disperses lead into the work area, such as brushing, shaking, or blowing.

At no time shall workers be allowed to leave the worksite wearing lead contaminated clothing or equipment, e.g. shoes, coveralls, or head gear.

All contaminated clothing and equipment shall be prevented from reaching the worker's home or vehicle. This is an essential step in reducing the movement of lead contamination from the workplace into a worker's home and provides added protection to employees and their families.

Gloves and protective clothing should be appropriate for the specific chemical exposure (e.g., solvents and caustics). Cotton gloves provide some protection against the contamination of hands and cuticles with lead dust. Workers should wear clothing that is appropriate for existing weather and temperature conditions under the protective clothing.

Heat stress

Workers wearing protective clothing can face a risk from heat stress. Additionally, heat stress may be an important concern when working in a hot environment or within containment

structures. Heat stress is caused by a number of interacting factors, including: environmental conditions, type of protective clothing worn, the work activity required, and the individual characteristics of the employee.

In situations where heat stress is a concern, employers should use appropriate work/rest regimens and provide heat stress monitoring that includes measuring employee's heart rates, body temperatures, and weight loss.

A source of water or electrolytic drink shall be close to the work area (in a non-contaminated eating/drinking area) so that it will be used often. Workers should wash their hands and face prior to drinking any fluid. Frequent fluid intake throughout the day will replace body fluids lost to evaporation. If such measures are used to control heat stress, protective clothing can be safely worn to provide the needed protection against lead exposure. The possibility of heat stress and its signs and symptoms should be discussed with all workers.

Health Effects

Lead can enter the body by means of ingestion or inhalation. Once it has entered the body, it is then absorbed by the blood stream which circulates it through the entire body. While the lead is being circulated, the body attempts to filter it out. Some of the lead is filtered out, but much of it is absorbed by soft tissue such as the kidneys, liver and brain tissue or hard tissue such as bones and cartilage.

Health effects from lead can vary depending on the length and level of exposure. In an acute exposure, an individual is exposed to a high level of contaminant over a short period of time. Exposures like this can result in a condition called encephalopathy, which affects the brain and quickly develops into seizures, coma and death from cardiorespiratory arrest.

In a chronic exposure, an individual is exposed to low levels of contaminants over a long period of time. This exposure can result in damage to the brain tissue, reproductive system, urinary tract, nervous system and the formation of blood. Some common symptoms of chronic exposure include:

- loss of appetite
- dizziness
- metallic taste in the mouth
- constipation
- muscle or joint pain
- headache
- pallor
- hyperactivity
- numbness
- insomnia

Lead Testing

Testing for the presence of lead can be done in the following ways:

1. Determination of air concentrations. (Follow NIOSH testing method 7082 or an equivalent.) Two pieces of equipment are needed for this—a personal air sampling pump and a membrane filter. These can be attached to an employee for personal monitoring or used for area monitoring.

   NOTE: The exposure level to lead in construction and general industry is 50 µg/m^3 (microgram per meter cubed) for air concentration.
2. Determination of water concentration. Obtain a water test kit or submit a sample to a laboratory.
3. Determination of soil concentration. Obtain a soil test kit or submit a sample to a laboratory.
4. Determination of blood lead level. Determined by blood sample taken by physician.

   NOTE: The exposure level for lead in blood is 50µg/dl (micrograms per deciliter).
5. Determination of surface lead level. Can be determined by convenient test kits.

   NOTE: Once the lead level is determined, it should be compared with the recommended level.

Lead Handling

Lead can be handled in the following ways:

1. Replacement—remove the entire piece and replace.
2. Encapsulation—cover the lead with another material.
3. Chemical removal—remove lead by chemical process
4. Physical removal—remove lead by heat gun and manual scraping
5. Blasting—remove by water or vacuum

   NOTE: Before removing lead, consult with state OSHA and EPA regulations. Lead must be disposed of according to state or local ordinances.

When working with lead, you should follow certain practices (29 CFR 1926.62):

1. Provide exhaust ventilation.
2. Use only HEPA (High-Efficiency Particulate Absolute) vacuums for cleanup.
3. Use a NIOSH/MSHA-approved respirator. (The type will be determined by the exposure level. See Table 1 below.)
4. Do NOT eat, drink or smoke in lead- contaminated areas. The employer must provide lunch room, hygiene, shower, and changing facilities.
5. Use proper protective clothing, shoe covers and gloves.
6. Wash hands thoroughly before eating.
7. Shower and change into clean clothes before leaving worksite.

TABLE 1.—RESPIRATORY PROTECTION FOR LEAD AEROSOLS

Airborne concentration of lead or condition of use	Required respirator [1]
Not in excess of 500 ug/m³	½ mask air purifying respirator with high efficiency filters.[2] [3]
	½ mask supplied air respirator operated in demand (negative pressure) mode.
Not in excess of 1,250 ug/m³	Loose fitting hood or helmet powered air purifying respirator with high efficiency filters.[3]
	Hood or helmet supplied air respirator operated in a continuous-flow mode—e.g., type CE abrasive blasting respirators operated in a continuous-flow mode.
Not in excess of 2,500 ug/m³	Full facepiece air purifying respirator with high efficiency filters.[3]
	Tight fitting powered air purifying respirator with high efficiency filters.[3]
	Full facepiece supplied air respirator operated in demand mode.
	½ mask or full facepiece supplied air respirator operated in a continuous-flow mode.
	Full facepiece self-contained breathing apparatus (SCBA) operated in demand mode.
Not in excess of 50,000 ug/m³	½ mask supplied air respirator operated in pressure demand or other positive-pressure mode.
Not in excess of 100,000 ug/m³	Full facepiece supplied air respirator operated in pressure demand or other positive-pressure mode—e.g., type CE abrasive blasting respirators operated in a positive-pressure mode.
Greater than 100,000 ug/m³ unknown concentration, or fire fighting.	Full facepiece SCBA operated in pressure demand or other positive-pressure mode.

[1] Respirators specified for higher concentrations can be used at lower concentrations of lead.
[2] Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.
[3] A high efficiency particulate filter (HEPA) means a filter that is a 99.97 percent efficient against particles of 0.3 micron size or larger.

Source: OSHA 29 CFR 1926.62

Medical Surveillance

All medical surveillance required by the standard must be performed by or under the supervision of a licensed physician. The employer must provide required medical surveillance without cost to employees and at a reasonable time and place. The standard's medical surveillance program has two parts-periodic biological monitoring and medical examinations. The medical surveillance is provided without cost to the employees.

Your employer's obligation to offer you medical surveillance is triggered by the results of the air monitoring program. Medical surveillance must be made available to all employees who are exposed in excess of the action level for more than 30 days a year. The initial phase of the medical surveillance program, which includes blood lead level tests and medical examinations, must be completed for all covered employees.

If the initial determination or subsequent air monitoring reveals employee exposure to be at or above the action level but below the permissible exposure limit the employer shall repeat air monitoring in accordance with this paragraph at least every 6 months. The employer shall continue air monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee. The sampling & monitoring should be performed at least monthly during the removal period. Any employee with elevated blood levels should be temporarily removed. Employees should be notified in writing within five days when lead levels are not acceptable. The standard requires temporary medical removal with Medical Removal Protection benefits.

The employer must, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually

in writing or by posting the results in an appropriate location that is accessible to affected employees. Whenever the results indicate that the representative employee exposure, without regard to respirators, exceeds the permissible exposure limit, the employer shall include in the written notice a statement that the permissible exposure limit was exceeded and a description of the corrective action taken or to be taken to reduce exposure to or below the permissible exposure limit.

Training

All employees who have potential exposure will be required to attend initial and annual training programs. The employees should be informed of the specific nature of the operations which could result in exposure to lead above the action level, the purpose, proper selection, fitting, use, and limitation of respirators, engineering controls, purpose & a description of the medical surveillance program & the medical removal program. Employee shall be informed of Appendices A & B of the regulation.

Signs

Signs must be posted to warn employees of the danger of lead in the area. The signs should state the following:

"Warning,"

"Lead Work Area,"

"Poison" and

"No Smoking or Eating."

These signs shall be illuminated and cleaned as necessary to ensure legibility (29 CFR 1926.62 Appendix B, XI).

BENZENE AWARENESS

Introduction

The following Awareness level Benzene Safety Program has been established by Apex Companies, LLC (APEX) to reduce employee exposure and potential hazards that may be encountered during various operations conducted at assigned work locations.

Employees are not expected to perform emergency response cleanup where concentrations of Benzene have the potential to be above the PEL (Permissible Exposure Limit) of 1ppm (part per million). Should employees be assigned such duties, specialize training will be provided.

APEX employees work in locations such as:

1. Petroleum pipeline sites
2. Above and below ground tank removal
3. Emergency response to gasoline and oil spills and

4. Soil remediation sites.

Employees shall be made aware of the host facilities contingency plans and programs for preventing exposure to Benzene.

Facts About Benzene

What benzene is

- Benzene is a chemical that is a colorless or light yellow liquid at room temperature. It has a sweet odor and is highly flammable.
- Benzene evaporates into the air very quickly. Its vapor is heavier than air and may sink into low-lying areas.
- Benzene dissolves only slightly in water and will float on top of water.

Where benzene is found and how it is used

- Benzene is formed from both natural processes and human activities.
- Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.
- Benzene is widely used in the United States . It ranks in the top 20 chemicals for production volume.
- Some industries use benzene to make other chemicals that are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of lubricants, rubbers, dyes, detergents, drugs, and pesticides.

How you could be exposed to benzene

- Outdoor air contains low levels of benzene from tobacco smoke, gas stations, motor vehicle exhaust, and industrial emissions.
- Indoor air generally contains levels of benzene higher than those in outdoor air. The benzene in indoor air comes from products that contain benzene such as glues, paints, furniture wax, and detergents.
- The air around hazardous waste sites or gas stations can contain higher levels of benzene than in other areas.
- Benzene leaks from underground storage tanks or from hazardous waste sites containing benzene can contaminate well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposure is tobacco smoke.

How benzene works

- Benzene works by causing cells not to work correctly. For example, it can cause bone marrow not to produce enough red blood cells, which can lead to anemia. Also, it can damage the immune system by changing blood levels of antibodies and causing the loss of white blood cells.

- The seriousness of poisoning caused by benzene depends on the amount, route, and length of time of exposure, as well as the age and preexisting medical condition of the exposed person.

Immediate signs and symptoms of exposure to benzene

People who breathe in high levels of benzene may develop the following signs and symptoms within minutes to several hours:

- Drowsiness
- Dizziness
- Rapid or irregular heartbeat
- Headaches
- Tremors
- Confusion
- Unconsciousness
- Death (at very high levels)

Long-term health effects of exposure to benzene

- The major effect of benzene from long-term exposure is on the blood. (Long-term exposure means exposure of a year or more.) Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells, leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.
- Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.
- Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.
- The Department of Health and Human Services (DHHS) has determined that benzene causes cancer in humans. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

How you can protect yourself, and what to do if you are exposed to benzene

First, if the benzene was released into the air, get fresh air by leaving the area where the benzene was released. Moving to an area with fresh air is a good way to reduce the possibility of death from exposure to benzene in the air.

- If the benzene release was outside, move away from the area where the benzene was released.
- If the benzene release was indoors, get out of the building.

If you are near a release of benzene, emergency coordinators may tell you to either evacuate the area or to “shelter in place” inside a building to avoid being exposed to the chemical. For more information on evacuation during a chemical emergency, see “Facts About Evacuation” at

http://emergency.cdc.gov/planning/evacuationfacts.asp . For more information on sheltering in place during a chemical emergency, see “Facts About Sheltering in Place” at http://emergency.cdc.gov/planning/Shelteringfacts.asp .

If you think you may have been exposed to benzene, you should remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.

Removing your clothing

Quickly take off clothing that may have benzene on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head.

If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.

Washing yourself

As quickly as possible, wash any benzene from your skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.

If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them after washing your hands and put them with the contaminated clothing. Do not put the contacts back in your eyes (even if they are not disposable contacts). If you wear eyeglasses, wash them with soap and water. You can put your eyeglasses back on after you wash them.

Disposing of your clothes

After you have washed yourself, place your clothing inside a plastic bag. Avoid touching contaminated areas of the clothing. If you can't avoid touching contaminated areas, or you aren't sure where the contaminated areas are, wear rubber gloves or put the clothing in the bag using tongs, tool handles, sticks, or similar objects. Anything that touches the contaminated clothing should also be placed in the bag.

Seal the bag, and then seal that bag inside another plastic bag. Disposing of your clothing in this way will help protect you and other people from any chemicals that might be on your clothes.

When the local or state health department or emergency personnel arrive, tell them what you did with your clothes. The health department or emergency personnel will arrange for further disposal. Do not handle the plastic bags yourself.

For more information about cleaning your body and disposing of your clothes after a chemical release, see (http://emergency.cdc.gov/planning/personalcleaningfacts.asp) “Chemical Agents: Facts About Personal Cleaning and Disposal of Contaminated Clothing”.

If you think your water supply may have benzene in it, drink bottled water until you are sure your water supply is safe.

If someone has swallowed benzene, do not try to make them vomit or give them fluids to drink. Also, if you are sure the person has swallowed benzene, do not attempt CPR. Performing CPR on someone who has swallowed benzene may cause them to vomit. The vomit could be sucked into their lungs and damage their lungs.

Seek medical attention right away. Dial 911 and explain what has happened.

How benzene poisoning is treated

Benzene poisoning is treated with supportive medical care in a hospital setting. No specific antidote exists for benzene poisoning. The most important thing is for victims to seek medical treatment as soon as possible.

Toxicity

Airborne: The maximum time-weighted average (TWA) exposure limit is 1 part of benzene vapor per million parts of air (1 ppm) for an 8-hour workday and the maximum short-term exposure limit (STEL) is 5 ppm for any 15-minute period.

Dermal: Eye contact shall be prevented and skin contact with liquid benzene shall be limited.

Appearance and Odor: Benzene is a clear, colorless liquid with a pleasant, sweet odor. The odor of benzene does not provide adequate warning of its hazard.

Health Hazard Data

Ways in which benzene affects your health. Benzene can affect your health if you inhale it, or if it comes in contact with your skin or eyes. Benzene is also harmful if you happen to swallow it.

Effects of Overexposure.

1. *Short-term (acute) overexposure*: If you are overexposed to high concentrations of benzene, well above the levels where its odor is first recognizable, you may feel breathless, irritable, euphoric, or giddy; you may experience irritation in eyes, nose, and respiratory tract. You may develop a headache, feel dizzy, nauseated, or intoxicated. Severe exposures may lead to convulsions and loss of consciousness.
2. *Long-term (chronic) exposure*. Repeated or prolonged exposure to benzene, even at relatively low concentrations, may result in various blood disorders, ranging from anemia to leukemia, an irreversible, fatal disease. Many blood disorders associated with benzene exposure may occur without symptoms.
3. The by-products of Benzene should be considered toxic and the same precautions shall be used when around or otherwise handling Benzene containing materials.

Identification

Liquefied or gaseous Benzene (C_6H_6) is a clear, colorless sweet-smelling aromatic highly flammable hydrocarbon that can usually be found naturally occurring in crude oil, and in

processed intermediate or finished product hydrocarbon streams at petrochemical or refining operation facilities. It is further described by the following physical and chemical characteristics:

Boiling Point (C 760 mmHg)	80.1C or 176F
Melting Point (C)	5.5C
Specific Gravity (H2O = 1)	0.879
Vapor Pressure (mm Hg) 7	4.6 @ 20C
Percent Volatile by Vol (%)	99+%
Vapor Density (Air = 1)	2.77
Evaporation Rate (BuAc = 1)	6.0
Solubility in Water (%)	Insoluble

NFPA Hazard Ratings :

Health: 2
Flammability: 3
Reactivity: 0
Special Hazards: None

Exposure Determination and Limits

Determination of employee exposure is made from breathing zone air samples that are representative of each employee's average exposure to airborne benzene. Representative 8-hour TWA employee exposures shall be determined on the basis of one sample or samples representing the full shift exposure for each job classification in each work area.

Determinations of compliance with the STEL shall be made from 15 minute employee breathing zone samples measured at operations where there is reason to believe exposures are high, such as where tanks are opened, filled, unloaded, or gauged; where containers or process equipment are opened and where benzene is used for cleaning or as a solvent in an uncontrolled situation..

Initial monitoring must be conducted at each covered work place or work operation to determine accurately the airborne concentrations of benzene to which employees may be exposed.

Periodic monitoring and monitoring frequency requirements must be met if the monitoring reveals employee exposure at or above the action level but at or below the TWA. This shall be repeated at least every year. IF the monitoring reveals employee exposure above the TWA, the monitoring shall be repeated for each such employee every (6) six months.

The Company may alter the monitoring schedule from every six months to annually for any employee for whom two consecutive measurements taken at least 7 days apart indicate that the employee exposure has decreased to the TWA or below, but is at or above the action level. Monitoring for the STEL shall be repeated as necessary to evaluate exposure of employees subject to short-term exposures.

Monitoring can be terminated if the initial monitoring reveals employee exposure to be below the action level, except as otherwise required. If the periodic monitoring reveals that employee exposures, as indicated by at least two consecutive measurements taken at least 7 days apart, are below the action level, then APEX may discontinue the monitoring for that employee, except as otherwise required.

Additional monitoring shall be conducted when there has been a change in the production, process, control equipment, personnel, or work practices which may result in new or additional exposures to benzene, or when APEX has any reason to suspect a change which may result in new or additional exposures. Whenever spills, ruptures, or other breakdowns occur that may lead to employee exposure, APEX or the host-facility shall monitor (using area or personal sampling) after the cleanup of the spill or repair of the leak, rupture or other breakdown to ensure that exposures have returned to the level that existed prior to the incident.

Monitoring accuracy shall be accurate to a confidence level of 95%, to within plus or minus 25 percent for airborne concentrations of benzene.

Employees shall be notified of all monitoring results, within 15 working days after the receipt of the results of any monitoring performed, in writing, individually or by posting of results in an appropriate location that is accessible to affected employees. Whenever PEL's are exceeded, the written notification shall contain the corrective action taken to reduce the employee exposure to or below the PEL, or shall refer to a document available to the employee which states the corrective action to be taken.

Controls

Hydrocarbon liquids and vapors are normally contained by designed closed systems consisting of reactors, towers, process piping, vessels, or stored in closed tanks, drums, barrels, cylinders, bottles, and cans. However, sometimes these closed systems rupture, leak, fail, or are required to be opened up for service work, increasing exposure potentials.

Benzene liquid is highly flammable and its vapors may form explosive mixtures in air. Fire extinguishers must be readily available for use. Smoking is prohibited in areas where Benzene is stored or used.

Regulated areas are then established wherever the airborne concentration of benzene exceeds or can reasonably be expected to exceed the permissible exposure limits, either the 8-hour time-weighted average exposure of 1 ppm or the short term exposure limit of 5 ppm for 15 minutes. Access to these regulated areas is then limited to authorized personnel who will be provided with appropriate levels of personal protective equipment.

Safe work practices are then instituted which could consist of or involve product line removal, blinding, blanking, draining, cleaning, steaming, purging, high-pressure washing, or neutralizing.

Safe-work procedures such as lock-out/tag-out, hot-work, or confined space entry are implemented to further control exposure potentials.

Personal Protective Equipment (PPE)

PPE will be worn where appropriate to prevent eye contact and limit dermal (skin) exposure to liquid benzene. Employees will refer to the PPE Program found in this manual, for proper protective equipment requirements, as well as comply with any host-facility's PPE rules or regulations. Employees can expect to wear one or more combinations of the following provided equipment, as based on the work permit requirements, operator's instructions, or established PPE guidelines:

- ANSI Z87.1 safety glasses with rigid side shields
- Chemical splash-proof goggles
- Full face-shield
- Chemical/hydrocarbon-resistant suit/coverall/clothing
- Chemical/hydrocarbon-resistant gloves
- Chemical/hydrocarbon-resistant over-shoes/boots

This equipment will be inspected prior to use and maintained in a safe working condition. If any defects are found or occur during use, this equipment will not be allowed for use and will be provided and replaced at no cost to the employee.

Respiratory Protection

Whenever the described engineering and work practice controls are determined to be ineffective at reducing employee Benzene exposure potentials, then respiratory protection will be provided in accordance with the Respirator Program, found in this manual, which meets the guidelines established by OSHA Regulation 29 CFR 1910.134 (b) (d) (e) and (f). Respirators shall be used in the following circumstances:

- During the time period necessary to install or implement feasible engineering and work practice controls;
- In work operations for which assessments establishes that compliance with either the TWA or STEL through the use of engineering or work practice controls is not feasible, such as some maintenance and repair activities or vessel cleaning;
- Other operations where engineering and work practice controls are infeasible because exposures are intermittent in nature and limited in duration;
- In work situations where feasible engineering and work practice controls are not yet sufficient or are not required to reduce exposure to or below the PEL's;
- In emergency cleanup situations can reasonably be expected to be encountered;

Employees will be required to participate in a respirator user's program to prevent Benzene exposures, and their selection of NIOSH/MSHA approved equipment will be based on the following guidelines:

- For airborne concentrations of 10 ppm or less, as a minimum, a half-face, negative-pressure, air-purifying respirator with organic vapor cartridge must be used.
- For airborne concentrations of 50 ppm or less, as a minimum, a full-face piece, negative-pressure, air-purifying respirator with organic vapor cartridges must be used
- For airborne concentrations of 100 ppm or less, as a minimum, a full-face piece, powered air-purifying respirator with organic vapor cartridges must be used.
- For any unknown or concentrations determined to be immediately dangerous to life and health (IDLH), a self-contained breathing apparatus (SCBA) with full-face piece in positive pressure demand mode, or a full-face piece, supplied-air respirator in positive pressure demand mode with auxiliary self-contained air supply must be used.
- For an emergency escape of any concentration, any organic vapor or supplied-air respirator must be used.

APEX shall select and provide, at no cost to the employee, the appropriate respirator as specified above, and shall ensure that the employee uses the respirator provided.

Where air-purifying respirators are used, The Company shall replace the air purifying element at the expiration of service life or at the beginning of each shift in which they will be used, whichever comes first. If an air-purifying element becomes available with an end of useful life indicator for benzene approved by MSHA/NIOSH, the element may be used until such time as the indicator shows no further useful life.

The Company shall permit employees who wear respirators to leave the regulated area to wash their faces and respirator face-pieces as necessary in order to prevent skin irritation associated with respirator use or to change the filter elements of air-purifying respirators whenever they detect a change in breathing resistance or chemical vapor breakthrough. All respirators issued to be worn shall be fit-tested according to the Company's Respirator User's Program found in this manual.

Medical Surveillance

The Company recognizes that some employees might be exposed to Benzene levels that could exceed established permissible exposure levels. The medical surveillance program has been implemented and the following guidelines are to be followed at all times:

- In the event employees are or may be exposed to Benzene at or above the action level of .5 ppm for 30 or more days per year.
- In the event employees are exposed to a PEL or greater for 10 or more days per year.
- For employees who have been exposed to more than 10 ppm of Benzene for 30 or more days in a year prior to the effective date of the standard when employed by a former employer.

APEX will assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician and that all laboratory tests are conducted by an accredited

laboratory. Persons other than licensed physicians who administer the pulmonary function testing required by this section shall complete a training course in spirometry sponsored by an appropriate governmental, academic or professional institution.

All examinations and procedures are provided at no cost to the employee and at a reasonable time and place. Within 60 days of the effective date of this standard, or before the time of initial assignment, APEX shall provide each affected employee with a medical examination including the following elements:

A. Detailed occupational history which includes:
    1. Past work exposure to benzene or any other hematological toxins
    2. A family history of blood dyscrasias including hematological neoplasms
    3. A history of blood dyscrasias including genetic hemoglobin abnormalities, bleeding abnormalities, abnormal function of formed blood elements
    4. A history of renal or liver dysfunctions
    5. A history of medicinal drugs routinely taken
    6. A history of previous exposure to ionizing radiation
    7. Exposure to marrow toxins outside of the current work situation.
B. Complete physical examination.
C. Laboratory tests. A complete blood count including a leukocyte count with differential, a quantitative thrombocyte count, hematocrit, hemoglobin, erythrocyte count and erythrocyte indices (MCV, MCH, MCHC). The results of these tests shall be reviewed by the examining physician.
D. Additional tests as necessary in the opinion of the examining physician, based on alterations to the components of the blood or other signs which may be related to benzene exposure, and
E. For all workers required to wear respirators for at least 30 days a year, the physical examination shall pay special attention to the cardiopulmonary system and shall include a pulmonary function test.

No initial medical examination is required if adequate records show that the employee has been examined in accordance with the procedures of this section within the twelve months prior to the effective date of this standard.

Periodic Examinations

APEX shall provide each affected employee with a medical examination annually following the previous examination. These periodic examinations shall include at least the following elements:

A. A brief history regarding any new exposure to potential marrow toxins, changes in medicinal drug use, and the appearance of physical signs relating to blood disorders.

B. A complete blood count including a leukocyte count with differential, quantitative thrombocyte count, hemoglobin, hematocrit, erythrocyte count and erythrocyte indices (MCV, MCH, MCHC); and
C. Appropriate additional tests as necessary, in the opinion of the examining physician, in consequence of alterations in the components of the blood or other signs which may be related to benzene exposure.

Where the employee develops signs and symptoms commonly associated with toxic exposures to benzene, APEX will provide employees with an additional medical examination which shall include those elements considered appropriate by the examining physician.

For persons required to use respirators for at least 30 days a year, a pulmonary function test shall be performed every three (3) years. A specific evaluation of the pulmonary system shall be made at the time of the pulmonary function test.

Emergency Examinations

In addition to the surveillance required, if an employee is exposed to benzene in an emergency situation, APEX will have the employee provide a urine sample at the end of the employee's shift and have a urinary phenol test performed on the sample within 72 hours. The urine specific gravity shall be corrected to 1.024. If the result of the urinary phenol test is below 75 mg. Phenol/L. of urine, no further testing is required.

If the result of the urinary phenol test is equal to or greater than 75 mg. Phenol/L. of urine, then APEX will provide the employee with a complete blood count including an erythrocyte count, leukocyte count with differential and thrombocyte count at monthly intervals for a duration of three 3) months following the emergency exposure. If any of the conditions specified exists, then the further requirements of this section shall be met, and APEX will, in addition, provide the employees with periodic examinations if directed by the physician.

Additional Examinations and Referrals

Where the results of the complete blood count required for the initial and periodic examinations indicate any of the following abnormal conditions exist, then the blood count shall be repeated within 2 weeks.

A. The hemoglobin level or the hematocrit falls below the normal limit (outside the normal 95% confidence interval (C.I.)) as determined by the laboratory for the particular geographic area and/or these indices show a persistent downward trend from the individual's pre-exposure norms; provided these findings cannot be explained by other medical reasons.
B. The thrombocyte (platelet) count varies more than 20% below the employee's most recent values or falls outside the normal limit (95% C.I.) as determined by the laboratory.
C. The leukocyte count is below 4,000 per mm 3 or there is an abnormal differential count.

- If the abnormality persists, the examining physician shall refer the employee to a hematologist or an internist for further evaluation unless the physician has good reason to believe such referral is unnecessary.

D. The Company will provide the hematologist or internist with the information required to be provided to the physician and the medical record required to be maintained. The hematologist or internist's evaluation shall include a determination as to the need for additional test, and APEX LLC will assure that these tests are provided.

Information Provided to the Physician

APEX will provide the following information to the examining physician:

- A copy of this regulation and its appendices.
- A description of the affected employee's duties as they relate to the employee's exposure.
- The employee's actual or representative exposure level
- a description of any personal protective equipment used or to be used
- Information from previous employment-related medical examinations of the affected employee which is not otherwise available to the examining physician.

Physician's Written Opinions

For each examination under this section, APEX will obtain and provide the employee with a copy of the examining physician's written opinion within 15 days of the examination. The written opinion shall be limited to the following information:

- The occupationally pertinent results of the medical examination and tests.
- The physician's opinion concerning whether the employee has any detected medical conditions which would place the employee's health at greater than normal risk of material impairment from exposure to benzene.
- The physician's recommended limitations upon the employee's exposure to benzene or upon the employee's use of protective clothing or equipment and respirators.
- A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions resulting from benzene exposure which require further explanation or treatment.

The written opinion obtained by APEX will not reveal specific records, findings and diagnoses that have no bearing on the employee's ability to work in a benzene-exposed workplace.

Based on the physician's/hematologist's/internist's written opinion, an employee can be removed from benzene exposure if the examinations reveals that exposure levels may exceed the action level. A follow-up examination will be provided to the affected employee. Return to a benzene work-related environment may occur based upon physician referral after a 6 month period and review of further medical testing that is conducted.

First Aid Measures

Eye Contact: Flush with water for at least 15 minutes. Get medical assistance.

Skin Contact: Wash with soap and water thoroughly. Immediately remove soaked clothing. Wash clothing separately before re-use.

Inhalation: Move person to fresh air. If breathing has stopped, perform artificial respiration. Get medical assistance immediately.

Ingestion: **Do no**t induce vomiting. **Do no**t give liquids. Get medical assistance immediately. Small amounts that enter the mouth should be rinsed out thoroughly.

Potential Health Effects (Acute and Chronic)

Symptoms of exposure include toxic by any route, headache, dizziness, nausea, weakness, breathing difficulties, collapse. May cause anemia, liver and kidney damage. Irritation on contact with skin or eyes; may cause eye damage. Benzene is a known, proven carcinogenic substance per NTP, IARC, & OSHA.

All known exposures are to be reported to the employee's immediate supervisor and member's management as soon as practical.

Non-compliance by any employees, with any part of this described program will result in disciplinary action as outlined in the Company's Corrective Action/Disciplinary Program.

References

- Regional poison control center: 1-800-222-1222
- Centers for Disease Control and Prevention
- Public Response Hotline (CDC)
- 800-CDC-INFO
- 888-232-6348 (TTY)
- E-mail inquiries: cdcinfo@cdc.gov
- Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), Pocket Guide to Chemical Hazards

PANDEMIC PLANNING

Business Continuity

Business continuity ensures that essential business functions can survive a natural disaster, technological failure, human error, or other disruption. Business continuity plans anticipate disruptions such as fires, earthquakes, and floods; these events are restricted to certain geographic areas, and the time frames are fairly well defined and limited.

Other disruptions can come in the form of pandemic occurrences. The pandemic flu is one example that would demand a different set of continuity assumptions due to **wide geographic dispersion and waves of infection/illness that can last over a long duration**. A pandemic

occurrence will spread rapidly and easily from person to person, affecting all businesses due to absenteeism. Businesses that are relied upon by other businesses will face the same massive absentee rates, and may be unable to provide essential components to maintain the daily operations.

Apex has developed partnerships, alliances, and third party supplier relationships to support continuity arrangements that will maintain operations and ensure these components are available during a pandemic.

The Apex Manager, Corporate Health and Safety will develop and coordinate a disease containment plan and will be responsible for dealing with disease issues and their impact on the workplace. This may include contacting local health officials and health care providers to develop and implement protocols for response to ill individuals.

Several basic steps would be implemented upon an outbreak. These include;

- Limit large close contact gatherings and increase space between workers if possible.
- Hand washing should be encouraged by managers and the availability of disposable towels, hand soap, and no touch trash cans insured.
- Train employees about prevention of the illness, initial symptoms, preventing the spread of the disease, and when it is appropriate to return to work.
- Explain expectations about disease containment and expected compliance.
- Appropriate immunizations should be encouraged if available.
- Emergency communication procedures should be tested to insure effectiveness.

A business impact assessment during a pandemic includes but is not limited to the following:

- Healthcare services not being available (they are already full at present with the usual ailments).
- Schools, churches and other public places not being open.
- Borders are partially or fully closed, especially airports, leaving people (our families, employees, business partners, customers and suppliers) “stranded”.
- Essential materials and supplies may be limited due to distribution chains that are affected by the travel restrictions or absentee workers supporting those transportation means.
- Essential services around utilities, food distribution/access and banking systems may not be at “normal levels”; access to cash flow could be tight.
- People may not be willing to or be able to come to work.

To ensure all Apex offices conduct **proactive business continuity planning**, on an annual basis, Senior Managers strategize with their management teams to:

- Review ALL possible scenarios and contingency plans in anticipation of a major outbreak and its potential impact to their operations.
- Carefully assess which staff, materials, procedures and equipment are absolutely necessary to keep business operating smoothly/efficiently.
- Define and document division/department's chain of command, including temporary succession planning in the event illness impacts key positions (not only leadership positions).
- Identify contingent worker resource pools to mitigate major absenteeism; consider temporary employee transfers to supplement vacancies/gaps created by serious illness.
- Speak with vendors and sub-contractors to determine if they have continuity plans in place to maintain operations in the event of a pandemic. All businesses will face the same potentially massive absentee rates and may be unable to provide essential components to satisfy commitments. Materials and supplies may be limited due to distribution chains that are affected by travel restrictions or absentee workers supporting those transportation means. Identify alternative arrangements to minimize impact to operations.
- Develop professional relationships with more than one company to use in case primary contractor cannot service needs. Create a contact list for existing critical business contractors and others planned to use.
- Determine which employees are currently set up to work from home. What percent of workforce could work from home, if necessary, and still be productive/billable?
- What additional equipment a/o connectivity is required to accommodate this arrangement? Involve IT in planning for key staff members to be set up to work from home if needed.
- Make sure team members know how to get in touch with one another outside of work. Update key contact directories. Distribute and communicate up-to-date employee personal contact information to your staff members.
- Take extra measures to ensure employees practice good office hygiene including wiping down common office equipment/areas [phones, copy and fax machines, kitchen counters, etc.] with sanitizing wipes before and after each use.
- Encourage employees to STAY HOME if they experience flu-like symptoms so as to minimize the spread of germs.
- Regularly communicate with employees to allay fears and concerns.
- Visit the CDC's site regularly for updated recommendations and warnings: http://cdc.gov/ as well as Flu.gov http://www.pandemicflu.gov/index.html. Stay in touch with local public health officials and health care providers, who can supply information about the signs and symptoms of regionally specific occurrences and recommend prevention and control actions.

HYDROGEN SULFIDE (H_2S) AWARENESS SAFETY PROGRAM

Introduction

Hydrogen sulfide presents a potential hazard to workers at the work site. It usually occurs as an unwanted by-product and can result in worker exposure in many different industries or occupations. Possible locations include:

1. Drilling Operations
    - A. Recycled Drilling Mud
    - B. Water from sour crude wells
    - C. Blowouts
2. Tank Gauging (tanks at producing, pipeline & refining operations)
3. Field Maintenance.
    - A. Tank batteries
    - B. Wells, etc

To ensure protection against exposure to hydrogen sulfide, both workers and employers must be aware of its properties, how it affects the body and what to do in emergency situations. The Safety and Health Manager shall ensure that all personnel who will be working at the job site will be properly trained in Hydrogen sulfide awareness and contingency procedures.

Hydrogen sulfide is also produced by the putrefication of organic matter and may accumulate in sewers, sewage treatment plants.

Physical/Chemical Characteristics

H_2S is a **highly toxic**, poisonous gas which is deadly to humans, and has no visible color. It is soluble in hydrocarbons and water at a ratio of 4: 1, and highly corrosive to certain metals due to either hydrogen embrittlement or sulfide stress cracking. H_2S is flammable when mixed with air at a temperature of 500 degrees F, and the lower flammability limit is 4.3% while the upper flammability limit is 46% by volume in air. When ignited, H_2S produces Sulfur Dioxide (SO_2) which is extremely hazardous and may leave victims disabled with pneumonia or respiratory damage.

Hydrogen Sulfide gas is 20% heavier than air, and can be dispersed great distances with only a slight breeze. As a result, unidentified locations about refineries or industrial settings could indicate detectable levels of H_2S. These may include low lying areas such as utility vaults, pits, ditches, trenches, confined spaces, inside dikes, or poorly ventilated areas.

NIOSH Publication 2005-149

NIOSH Pocket Guide to Chemical Hazards

September 2005

Hydrogen Sulfide	CAS 7783-06-4
H2S	RTECS MX1225000
Synonyms & Trade Names Hydrosulfuric acid, Sewer gas, Sulfuretted hydrogen	DOT ID & Guide 1053 117

Exposure Limits	
	NIOSH REL: C 10 ppm (15 mg/m^3) [10-minute]
	OSHA PEL†: C 20 ppm 50 ppm [10-minute maximum peak]

IDLH	Conversion
100 ppm See: 7783064	1 ppm = 1.40 mg/m^3

Physical Description

Colorless gas with a strong odor of rotten eggs. [Note: Sense of smell becomes rapidly fatigued & can NOT be relied upon to warn of the continuous presence of H_2S. Shipped as a liquefied compressed gas.]

MW: 34.1	BP: -77°F	FRZ: -122°F	Sol: 0.4%
VP: 17.6 atm	IP: 10.46 eV	RGasD: 1.19	
Fl.P: NA (Gas)	UEL: 44.0%	LEL: 4.0%	

Flammable Gas

Incompatibilities & Reactivities

Strong oxidizers, strong nitric acid, metals

Measurement Methods

NIOSH 6013; OSHA ID141
See: NMAM or OSHA Methods

Personal Protection & Sanitation

(See protection codes)
Skin: Frostbite
Eyes: Frostbite
Wash skin: No recommendation
Remove: When wet (flammable)
Change: No recommendation
Provide: Frostbite wash

First Aid

(See procedures)
Eye: Frostbite
Skin: Frostbite
Breathing: Respiratory support

Respirator Recommendations

NIOSH
Up to 100 ppm:
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes

inhalation, skin and/or eye contact

Symptoms

Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite

Target Organs

Eyes, respiratory system, central nervous system

Personal Detection

Hydrogen Sulfide (H_2S), also known as Sulfereted Hydrogen, Hydrosulfuric Acid, Sour Gas, Sulfur Hydride, Rotten-Egg Gas, or Sour Crude can be easily detected due to a strong odor of rotten eggs, or to others, a sweet, offensive, sickening odor. Although it can be detected at a low concentration of 1 ppm, this early warning property should not be depended upon as an accurate indicator of its presence. **Hydrogen sulfide detection by your nose may not occur as a concentration of this gas between 100 and 150 ppm can deaden your sense of smell.**

Health Effects

Hydrogen Sulfide gas is a rapidly-acting systemic poison which causes respiratory paralysis and asphyxia at high concentrations. It can irritate the eyes and respiratory tract at low concentrations. At a concentration greater than 700 ppm, inhalation of H2S may cause coma and/or death after a single breath.

It is important to note here that each individual person may be affected differently by different concentration levels of H_2S. Some individuals are more sensitive to H_2S and will be affected by a smaller concentration, and others may be less sensitive and can tolerate higher concentrations without experiencing adverse health effects. If you should smell the presence of H_2S or hear warnings from monitor alarms, then immediately evacuate this area and notify the host-facility operator or Apex management. Do not re-enter this area without proper respiratory protection.

H_2S is classed as a ***chemical asphyxiate***, similar to carbon monoxide and cyanide gases. It inhibits cellular respiration and uptake of oxygen, causing biochemical suffocation. Typical exposure symptoms include:

0 - 10 ppm	Irritation of the eyes, nose and throat
10 - 50 ppm	Headache, Dizziness, Nausea and vomiting, Coughing and breathing difficulty
50 - 200 ppm	Severe respiratory tract irritation, Eye irritation / acute conjunctivitis, Shock, Convulsions, Coma, Death in severe cases

Prolonged exposures at lower levels can lead to bronchitis, pneumonia, migraine headaches, pulmonary edema and loss of motor coordination.

Monitoring

Wherever possible, exposure should be minimized by employing adequate ***engineering controls*** and ***safe working practices***. Such methods include ensuring good ventilation and changing work procedures and practices. Where engineering controls cannot adequately control levels of exposure, it may be necessary to supplement them with the use of suitable ***personal protective equipment*** (PPE). An approved self-contained breathing apparatus or airline respirator with escape SCBA should be used. A qualified industrial hygienist or safety

professional should be consulted for guidance on the suitability, training, fit test and correct use of respirators.

Identification of hydrogen sulfide concentrations may require monitoring if the site safety officer or project manager determines the necessity air monitoring.

The exposure limit is set to alarm at a concentration of 10 ppm.

First Aid

First aid needs will depend on the concentration level of contaminant H2S. Do not immediately rush to the aid of an affected coworker unless properly trained and without protecting yourself with proper PPE. Signs and symptoms of an exposure may be respiratory paralysis by inhalation, burning sensation of the eyes due to contact, or skin irritation.

Inhalation - remove victim to fresh air immediately. If not breathing, administer mouth-to-mouth artificial respiration until medical assistance arrives or victim is deceased. If breathing is restored but slow and labored, administer 100% oxygen by canister/mask as H_2S is rapidly detoxified by the body. Maintain normal body temperature. Transportation to medical services should follow immediately.

Eye or skin contact - should be treated by a 15 minute wash/flush at a safety shower/eye-wash station. If irritation or discomfort persists, transportation to medical services should follow immediately.

Non-compliance by any Apex employee, with any part of this described program will result in disciplinary action as outlined in the Company's Corrective Action/Disciplinary Program.

ASBESTOS-CONTAINING MATERIALS (RESERVED)

BIOLOGICAL/CHEMICAL WARFARE EMERGENCY RESPONSE (RESERVED)

IONIZING RADIATION PROTECTION PROGRAM (RESERVED)

10.0 SAFETY PROGRAMS

CENTRAL SAFETY COMMITTEE

Apex must establish and actively maintain a Central Safety Committee (CSC) for the purpose of overseeing general safety issues and assuring that environmentally sound, safe and healthy work conditions exist for Apex personnel.

Duties and Functions

The CSC duties and functions shall include, at a minimum, the following:

- Conduct routine office and job site safety inspections;
- Perform periodic reviews of company safety policy and procedures;
- Manage the investigation of accidents, incidents and illnesses, near misses, and work-related automobile accidents and ensure reports are prepared and documented;
- Evaluate accident and illness prevention programs;
- Perform job hazard analyses for office and field personnel in conjunction with project management;
- Maintain and post OSHA-Recordable Injuries and Illnesses during the period, February 1st through May 1st of each year, as required by OSHA;
- Coordinate training and medical exams for office personnel;
- Provide overall communication and reinforcement of the EHS program for Apex; and
- Recommend program changes to the EHS Manual.

Training

All CSC members shall be trained in the responsibilities of being a committee member.

Participation

The Central Safety Committee shall consist of at least one field, one office and one management representative. Committee size will vary according to office population; however, the goal is to have equal representation of each group of employees (management/field/office) per office. Committees should consist of between three (3) to 15 members to function most productively. The term of each Committee member position is one (1) year; each year new committee members are rotated, whenever possible.

A secretary shall be elected by the committee and shall have the following responsibilities:

- Maintain a roster containing the names and departments of all committee members;
- Post names of current committee members to ensure that all employees can readily contact committee members;
- Keep a record of attendance and minutes of meetings and forwards minutes to a designated EHS specialist;
- Retain records for at least three years in a centralized location;

- Schedule meetings; and
- Distribute or post a copy of minutes of office CSC meetings for office personnel to review. Postings should remain until subsequent meeting/teleconference minutes are posted.

Schedule

The CSC for each office should meet every six to eight weeks. Meetings typically last one hour.

Meeting Agendas

A typical agenda for office CSC meetings should consist of the following topics:

- Meetings should start with a general safety topic for discussion and attendees documented;
- Review and evaluate: (1) injury and illnesses; (2) motor vehicle accidents; (3) Near misses and (4) employee suggestions for safety improvements;
- New business;
- Status of previous meeting action items;
- Miscellaneous items; and
- Discussion of safety awareness topics that can be discussed at general staff meetings.

Additional CSC Activities

Inspections: The CSC shall make monthly office and warehouse inspections in order to monitor general conditions of housekeeping, fire protection systems, posting of evacuation plans, container labeling, maintenance of MSDS, machine guarding and first aid kits. Checklists for office and warehouse inspection will be developed by Apex and used during monthly inspections by the CSC.

Hazard Prevention: Committee members should routinely discuss and develop safe operating procedures for handling of hazardous materials and equipment associated with office services.

Corrective Programs: Committee members should support the ongoing engineering and administrative efforts to be sure jobs are designed with safety in mind. The CSC should ensure that SSHPs are prepared for each project involving work with hazardous materials and hazardous waste. The CSC should also ensure that a general health and safety checklist is being completed for all projects where minimal exposure to hazardous materials or machinery is likely, such as Phase I Environmental Site Assessments and site trips for photographs. The intent of the checklist is to ensure that potential hazards are identified prior to site entry so that adequate personal protective equipment can be utilized, or brought to the site by Apex personnel, and used if necessary.

Investigations: All work-related accidents and injuries should be discussed; the CSC should determine the root cause and contributing factors and suggest corrective measures.

Coordinate Safety Training: The CSC should aid in scheduling training events such as Bloodborne Pathogens, HAZWOPER, Hazard Communication, Confined Space Entry, Lockout/Tagout, New Employee Orientation and other training that may be needed for office personnel.

Development of Safety Topics for Staff Meetings: The CSC should develop safety topics for discussion at general staff meetings.

References

No references for this section.

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE (HAZWOPER)

The general category of hazardous waste cleanup and related work activities fall within the scope of OSHA's HAZWOPER standard (29 CFR 1910.120/1926.65).

Operations associated with cleanup operations include: site investigation, characterization, decontamination, dismantlement, and the processing, management and appropriate environmentally sound disposal of wastes from historically contaminated sites and/or facilities.

Hazardous waste clean up activities can expose workers and other personnel to safety and health risks ranging from exposure to physical hazards such as those encountered in construction, to chemical and possibly radiation exposure hazards associated with the less than proper or sound handling, storage, processing and disposal of hazardous wastes. Often, the types, quantities, locations and packaging of hazardous materials are unknown or uncharacterized when workers enter and perform work in contaminated areas. The long term risks associated with unprotected chronic or episodic exposures to unknown or undetermined levels of hazardous materials are potentially significant health hazards which are not well understood or documented.

In addition to environmental restoration operations, the HAZWOPER standard also addresses the operation of hazardous waste treatment, storage and disposal facilities (TSDFs) (regulated by paragraph (p) of 1910.120) and certain emergency response activities regardless of their location (regulated by paragraph (q) of 1910.120).

Apex's HAZWOPER Program will enable employees to identify, evaluate and control safety and health hazards and provide for emergency response for hazardous waste operations.

Work Zones at Hazardous Material Sites

Exclusion Zone

The EZ or "Hot" Zone is the area suspected of contamination and presents the greatest potential for worker exposure. An EZ will also be established when opening systems that may

come into contact with Site contaminants or process chemicals. Personnel entering EZs must wear the mandated level of protection for the activity being performed.

EZs shall be identified through the use of yellow caution tape and stanchions, traffic cones, barricades, or other holders. The EZ must include all areas of potential exposure and usually will extend at least 10 feet from the work. The zone size will be modified, as necessary, based on air monitoring and work being performed.

Contamination-Reduction Zone

The CRZ or "Transition" Zone will be established between the EZ and SZ. In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the EZ through the CRZ.

Support Zone

The SZ serves as a clean, controlled area. During normal operations, the process area and any designated support areas are considered the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment or clothing will not be allowed in the SZ.

General

The following items are requirements to protect the health and safety of workers at job sites and will be discussed regularly.

- Eating, drinking, chewing gum or tobacco, smoking, applying cosmetics or lip balm, or any practice that increases the probability of hand-to-mouth transfer and ingestion of contamination is prohibited in the EZ, CRZs, lab area, and process floor;
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco, smoking applying cosmetics or lip balm, or other activities which may result in ingestion of contamination;
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy will face disciplinary action;
- Proper decontamination procedures must be followed when leaving the EZ;
- Any site personnel unable to pass a fit test, as a result of facial hair or facial configuration, shall not enter or work in an area that requires respiratory protection.
- No alcohol or drugs (without prescription) will be allowed on-site at any time. Firearms are only allowed for security purposes, if allowed by the local law enforcement agency.
- All personnel who take prescription medication that can make them drowsy or otherwise unfit for duty should report it to the project EHS specialist. The project EHS specialist, in consultation with a physician, will then determine if the individual should be allowed to work on Site and in what capacity. The project EHS specialist may require a letter from the individual's personal physician stating what limitations, if any, the medication may

impose on the individual. The employee does not need to identify what medication he/she is taking;

- Removal of contaminated soil from protective clothing or equipment by blowing, shaking, or any other means that disperse contaminants into the air is prohibited;
- Lockout/Tagout procedures will be implemented prior to performing any work on equipment for controlling hazardous energy;
- Only authorized entrants, attendants, and supervisors trained in confined space entry procedures will be permitted to conduct work in or near confined spaces. OSHA confined space entry standard requirements must be complied with; and
- Engineering controls and work practices shall be instituted to minimize or remove employee exposure to the permissible exposure limits (PEL) for substances regulated by OSHA, except to the extent that such controls and practices are not feasible.

Site/Activity-Specific Safety and Health Plan (SSHP)

The Apex Project Manager must ensure that a SSHP is completed for any project involving potential exposure to hazardous waste

The general methods for conducting work site hazard identification and assessment are provided in Section 8.0 and 13.3 of this EHS Manual. Adequate time must be allotted to an Apex EHS specialist to review the SSHP to evaluate the need or selection of air monitoring, personal protective gear and other health and safety related equipment.

The SSHP must be maintained at the site and be readily available as a reference tool for all personnel entering the work area. Affected personnel including visitors, must receive the appropriate level of training specified by paragraph (e), of 29 CFR 1910.120 and must acknowledge that they have read, and are thoroughly familiar with the requirements of the SSHP.

All tasks, activities and associated or anticipated hazards must be addressed by the SSHP, including any preliminary onsite contamination evaluation or characterization activities and results, and any safe work permits required such as confined space entry, hot work, etc.

The HAZWOPER regulations specify the elements to be included in a SSHP. These required SSHP components are described below.

Hazard assessment characterizations/evaluations should be conducted to identify pre-existing conditions and associated hazards. Such characterizations can be conducted by examining all available site historical records, site related incidents, any complaints and/or previously completed investigations.

Site Personnel Safety and Health Training

The requirements for developing and implementing a safety and health training program are addressed in the training section of the EHS manual. However, Apex requires all field personal

to be 40 hour HAZWOPER trained with current 8 hour refresher. Some field technicians will be under the direct supervision of an experienced HAZWOPER project managers during the on-site field work requirement of the 40 hour certification. Project managers that assume the role of on-site incident commander will receive additional training in site specific incident command. Project managers will use a qualified hazardous material specialist (CHMM or trained as a hazardous material specialist) when required. All trainers will by education and/or experience, be qualified to train in the area they are training. Employees who are trained in accordance with the plan shall receive annual refresher training. A record of methods used must be kept in the H&S training files.

Personal Protective Equipment Selection

The Apex EHS specialist will designate a level of PPE protection for each work task and they will include this information in the SSHP. The general hazard based selection and use of PPE for protecting workers during most work operations is addressed in the personal protection equipment (PPE) section of the EHS Manual.

As work progresses the EHS Specialist will use direct reading instruments (when available), such as organic vapor analyzer (OVA), PID, FID, colorimetric detector tubes to determine concentrations of hazardous atmospheric contaminants. This information will be used to define or revise (upgrade or downgrade as appropriate) the level of PPE specified in the SSHP.

Medical Surveillance Program

The requirements for a medical surveillance program are addressed in Section 9.2. The additional requirements for enrolling workers into a HAZWOPER based medical monitoring program include:

- Exposure to hazardous substances (or health hazards) at or above the PEL or TLV (without consideration of respirator use), or the required use of respiratory protection for 30 days or more a year;
- Regular wear of impermeable protective clothing during hot weather, sustaining a work related injury, or developing signs/symptoms of hazardous material exposure related illness; and
- Participation in the site's emergency response (HAZMAT) team.

Industrial Hygiene and Environmental Hazard Monitoring

The requirements for developing and implementing an industrial hygiene and environmental hazard-monitoring program are addressed in Section 8.0. Additionally, industrial hygiene exposure monitoring will be conducted upon initial site entry and periodically thereafter, whenever there is indication of a potential IDLH condition, a flammable vapor condition may exist, and/or when there are indications that exposures may be trending upwards or have exceeded recognized exposure limits.

Work Site Control Program

Site control procedures will be implemented to control employee exposure to hazardous substances prior to implementing remediation programs. Site controls will be developed during the planning stages of hazardous waste cleanup operations and modified as necessary when new information becomes available. During maintenance activities or other activities where contact with contaminants or process chemicals is possible, zones will be established to control the exposure to and spread of contaminants as follows:

The work site control program will include at a minimum:

- A site map;
- Work zones that include a hot zone, contamination reduction zone and a support zone;
- Use of a buddy system;
- Site communications including emergency notifications;
- Standard operating procedures for safe work practices; and
- Identification of the nearest medical assistance and directions to a hospital.

Decontamination Procedures

Personnel and equipment decontamination is required to ensure that hazardous substances are not carried from contaminated areas. Procedures for conducting decontamination operations need to be developed. Also, shower and change room facilities must be provided when hazardous waste cleanup or removal operations commence on a site and when the duration of the work will require six months or greater time to complete. Apex will provide adequate washing facilities where hazardous substances may be harmful to employees.

Emergency Response and Spill Containment Plan

An emergency response plan will be developed for handling potential emergency conditions at the hazardous waste cleanup site. If site workers are evacuated from the danger area and are not required to actively respond to the emergency condition(s), then only the implementation of an emergency action plan (as specified by 1910.38) is required. The elements required to be addressed by an emergency response plan include:

- Pre-emergency planning;
- Personnel roles, lines of authority, and communication;
- Emergency recognition and prevention;
- Safe distances and places of refuge;
- Site security and control;
- Evacuation routes and procedures;
- Decontamination procedures;
- Emergency medical treatment and first aid;

- Emergency alerting and response procedures;
- Critique of emergency response drill/incident and follow-up; and
- PPE and emergency equipment.

Confined Space Entry Procedures

The requirements for developing and implementing a confined space entry procedure are addressed in confined space entry section of the EHS Manual.

Post-emergency Response Operations

Apex will, if specified in the scope of work (SOW) for the project, address the removal of hazardous substances, health hazards and materials contaminated with them from the site utilizing proper disposal methods and documentation. This may require longer term remediation.

References

- OSHA 29 CFR 1910.120/1926.65, HAZWOPER standard
- OSHA 29 CFR 1910.38, Emergency Action Plans
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities NIOSH/OSHA/USCG/EPA

NON-HAZARDOUS WASTE SITE EMERGENCY PREPAREDNESS

Many Apex projects involve non-hazardous waste sites. An Apex EHS specialist will be the focus of all communications between the host employer organizations and Apex personnel.

The project EHS specialist shall become familiar with the project/work area specific Emergency Response and Emergency Action Plans (including alarms and evacuation signals) applicable and in effect at the particular location where project work activities are taking place. The project EHS specialist in turn shall:

- Brief Apex personnel concerning job site emergency procedures;
- Ensure that in the event of an emergency response/evacuation activities proceed effectively;
- Verify that evacuation areas have been cleared by their team members and that each team member is accounted for.
- When the evacuation of the project team has been completed, the EHS specialist will notify the project's designated responsible official that all Apex project personnel are clear of the emergency areas and will then await further instructions.

References

No references for this section.

CONFINED SPACE ENTRY PROGRAM

Entry into a confined space is potentially one of the most dangerous activities that Apex employees may face. Due to the unique conditions that can exist, great care must be taken both before and during this type of work procedure. This program is written to be in compliance with OSHA Regulation 29 CFR 1910.146, and designed to assist the employees of Apex when they performing entry operations.

Asphyxiation is the leading cause of death in confined spaces due to situations involving IDLH (immediately dangerous to life and health) atmospheres that are poorly ventilated as compared to more open areas that generally have natural ventilation. All efforts will be devised to control oxygen deficient/combustible/toxic environments that may be encountered prior to or during work activities. Total energy isolation is required before any entry will be allowed.

Examples of confined spaces include, but are not limited to fixed and mobile storage tanks, process vessels, pits, storage compartments, silos, vats, certain types of excavations, reaction vessels, boilers, ventilation ducts, sewers, tunnels, underground utility vaults and pipelines.

Management/Employee Responsibilities

The EHS Coordinator is responsible for the overall implementation of this program or the requirements of any host-facility program while working on contracted projects at host facilities. Due to the extremely severe consequences possible if improper confined space entries are made, all employees will comply with the provisions of this program.

Identification

The identified confined space will be identified to all employees by the use of a red/white hazard-warning sign with black letters stating:

Currently we have no known confined spaces for Apex offices, only at host facility job sites.

Hazard Evaluation

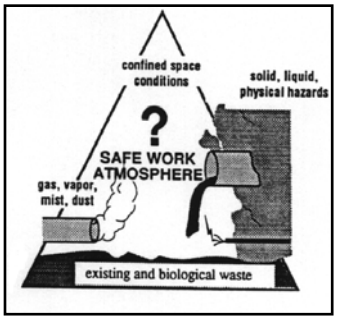
Testing or monitoring conditions prior to entry and during entry operations will be conducted by the host-facility unit operator, designated EHS personnel, or other qualified personnel, by the use of a calibrated, direct-reading, gas monitor. The tests shall be performed in this order:

- Oxygen concentration (19.5% - 23.5% range);
- Flammable gases/vapors (less than 10% of LEL);
- Potential toxic concentrations (less than listed PEL's)

The results shall be recorded on the host-facility entry permit, and entry into the confined space will not be allowed unless the defined acceptable entry conditions are met. Continuous or intermittent monitoring of the permitted space may be implemented depending on the potential atmospheric conditions that may be experienced during operations. Employees or their

representatives are entitled and encouraged to request additional air monitoring at any time that work is underway.

Initially, the air monitoring instrument probe or line must extend into the confined space at least several feet. The person performing the air monitoring should not break the plane of the confined space with their body. Since particular gases can stratify in layers in a confined space, testing will be performed at multiple levels of the space to be entered.



If an instrument reading ever indicates an unusual, unexpected, or unacceptable atmospheric condition, it is never to be ignored, or assumed to be due to instrument error. If a bad reading is recorded, all necessary measures will be taken to correct the situation (recalibrate instrument, ventilate space, etc). Apex employees will not be expected to enter confined spaces until it is deemed safe to do so, and the acceptable entry conditions are recorded on the entry permit.

Lighting sources (drop cords) to be used in the permit confined space shall be explosive-proof and specifically approved by a recognized agency such as Underwriter Laboratory or the Mine Safety and Health Administration for use in potentially explosive atmospheres.

Any electrically operated tool taken inside the permit space shall be double insulated, inspected for defects and connected to an approved ground fault circuit interrupter (GFCI) that has been inspected and tested before use.

All ladders used for entry/exit into the permit confined space must meet all applicable codes and standards as outlined in 29 CFR 1910.25 or .26, and inspected prior to use. They must not interfere with rescue or retrieval systems, ventilation methods, and work operations.

Ventilation

If the atmospheric entry conditions cannot be met as defined in this written program, continuous forced-air ventilation methods will be utilized at all times to eliminate the hazardous atmosphere. An oxygen source with a concentration greater than 23.5% is not allowed as a ventilation or air dilution method.

If ventilation is unsuccessful, as demonstrated by unacceptable retesting results, or even if acceptable conditions are unable to be consistently maintained during actual entry operations, authorized entrants will be required to wear appropriate respiratory protective equipment in compliance with OSHA Regulation 29 CFR 1910.134.

This equipment selection will be based on the atmospheric test results that will indicate the proper level of respiratory protection to be worn (See Section 9.1, the Respiratory Protection Program).

Entry Permits

The **authorized Entry Supervisor** shall prepare the entry permit and record all testing results on the permit. Apex employees involved in the entry will participate in the permit review and sign the permit prior to the commencement of permit authorized work activities. A copy of a Confined Space Permit is provided in Appendix A. This system will provide the best assurance that confined space entry takes place only after all actions and conditions necessary for the protection of authorized entrants have been performed. Permits will be canceled upon completion of work, or for emergency evacuation due to dangers occurring inside or outside the space that could directly affect the life or health of an entrant.

When entry operations have been completed, the entry Supervisor shall write, “canceled”, across the permit noting date and time (cancellation reason to be listed only if a dangerous incident, injury or hazard occurred.). As required by 1910.146(f) the entry permit will identify the following information: space to be entered, purpose of entry, date and authorized during, authorized entrants and attendants, hazards of permit space, measures taken to isolate space, acceptable entry conditions, results of monitoring, initials of tester, rescue and emergency services information, communication procedures, and equipment to be used.

If an emergency occurs and evacuation of the space is required, the space will be re-evaluated to determine the cause, extent, and nature of the hazard encountered. The hazard will be eliminated before entry is again permitted, after inspection and testing is satisfactory.

Permits or copies will be retained for a period of at least one year by the **host facility**. The written program must be reviewed annually (unless no entries were made during the prior 12 month period) and revised as necessary to protect employees from confined space hazards when injuries, near-misses, employee complaints or unauthorized entry occurs.

Training

Whether you are an **entrant, attendant, entry Supervisor** or part of the support personnel, training is mandatory. Training will be provided:

- Before any employee is assigned any duties;
- Before any assigned duties are changed;
- Whenever there is a change in operations affecting the space; and
- Whenever an employee demonstrates deficiencies or deviations from the initial training provided.

Written certification to include employee’s name, trainer signature/initials and dates of training will be provided upon completion of required levels of training as provided by outside contract

training resources, or Apex Management, and maintained in the Employee Personnel Files at the Branch or Project office. Certification must be made available to employees and their authorized representatives.

Roles and Responsibilities

Duties of Authorized Entrants

- Apex shall ensure that all authorized entrants:
- Know the hazards that may be faced during entry, including information on the mode, signs, or symptoms of these hazards, and consequences of any exposure;
- Properly use all tools and safety equipment as required; and,
- Communicate with the attendant as necessary to enable the attendant to monitor the entrant(s) status and to alert entrant(s) of the need to evacuate the space as required.

Authorized entrants must alert the attendant when:

- They recognize any warning sign or symptoms of exposure to a dangerous situation; or,
- They detect a prohibited condition.

Authorized entrants must exit from the permit space as quickly as possible when:

- An order to evacuate is given by the attendant or the entry supervisor;
- They recognize any warning sign or symptom of exposure to a dangerous situation;
- They detect a prohibited condition; or,
- An evacuation alarm is activated.

Duties of Attendants

Apex shall ensure that all **attendants**:

- Know the hazards that may be faced during entry, including information on the mode, signs, symptoms, and consequences of the exposure;
- Are aware of possible behavior effects of hazard exposure in **authorized entrants**;
- Continuously maintain an accurate count of **authorized entrants** in the permit space and ensure that the means used to identify **authorized entrants** accurately identifies who is in the permit space;
- Remain outside of the permit space during entry operations until relieved by another **attendant**. If an **attendant** is trained and equipped for rescue, they may attempt non-entry rescue provided that they have been relieved by a properly outfitted and trained **attendant**. Any unauthorized personnel will be prohibited from attempting any type of rescue;
- Communicate with **authorized entrants** as necessary to monitor entrant status and alert entrants of the need to evacuate the space as required;
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order the **authorized entrants** to evacuate the permit space ***immediately*** under any of the following conditions:

- if they detect a prohibited condition;
- if they detect the behavioral effects of hazard exposure in an authorized entrant;
- if they detect a situation outside the space that could endanger the authorized entrants; and
- if they cannot, for any reason, effectively and safely perform all the duties required.

- Summon rescue and other emergency services as soon as they determine that authorized entrants may need assistance to escape from permit space hazards. By whatever means are available (voice, radio, phone), the attendant shall contact the **entry supervisor** for assistance and notify host-facility operator of emergencies.

Apex Management does not allow more than one confined space to be monitored by the attendant at any one time.

Duties of Entry Supervisors

Apex must ensure that all **Entry Supervisors**:

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- Verify that all tests specified by the permit have been conducted and all procedures and equipment specified by the permit are in place before signing the permit and allowing entry to begin;
- Terminate the entry and cancel the permit as required;
- Verify that rescue services are available and the means to summon them are operable;
- Remove unauthorized individuals who enter or attempt to enter the permit space during entry operation;
- Determine whenever responsibility for permit space entry operation is transferred, and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and acceptable entry conditions are maintained; and
- Coordinate entry operations for multi-employers' so that employees of one employer do not endanger the employees of any other employer.

Entry Procedures

No employee of Apex will be allowed to enter a permit-confined space unless the following procedures are followed:

- The confined space must be properly tested for acceptable ranges of oxygen content, flammable atmosphere and toxic concentrations present, using a calibrated, direct-reading, gas-monitoring instrument, operated by a trained Supervisor. (There can be no longer than a **2-hour time gap** between tests performed and any space entry.)

- The permit space shall be identified by appropriate signs, and the external area barricaded to ensure that no unauthorized persons, equipment or vehicles present a danger to **authorized entrants**.
- No smoking or flammable, combustible materials are allowed within this barricaded area. A properly inspected, charged ABC dry chemical fire extinguisher is required to be outside the permit space, ready to use. No welding gas tanks are allowed inside the permit space, and all hoses, regulators, leads, electrode holders or other welding/cutting equipment will be inspected before entry into the permit space. Equipment found to be defective will not be allowed for use.
- Communication methods will be by voice, visual contact or two-way radios that are required to be intrinsically safe in design.
- Properly inspected, approved entry/exit means will be secured into position, following all established safe ladder-use guidelines.
- Ventilation equipment will be activated and provide continuous forced air from clean air sources, so that proper air exchanges for the enclosed space is maintained at all times for permit space occupancy.
- Approved, properly rated (12V - explosion-proof) light sources, or intrinsically safe flashlights will be provided for safe illumination while working inside a permit space.
- Appropriately selected PPE will be donned prior to vessel entry, and worn at all times while inside the permit space. (Examples are hard hats, splash/impact goggles, face-shields, safety glasses, respirators, protective clothing, steel-toed shoes, earplugs & gloves.) Defective equipment shall not be used but shall be discarded and replaced.
- After the space has been tested and declared safe for entry, the entry permit shall be completed, conditions explained to all authorized personnel, signed by all authorized personnel, and posted at a conspicuous location outside/on the vessel.
- The **attendants** shall be assigned to their appropriate duties. The entrants may then enter inside the confined space, and the **Entry Supervisor** is accountable for maintaining safe operations.

Rescue and Emergency Services

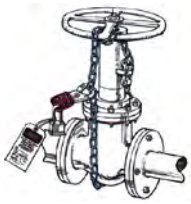
The authorized **Entry Supervisor** will be notified by the **attendant** that emergency rescue operations are required.

Rescue services must be either:

1. Provided by the host facility, or
2. Provided by an outside service which is given an opportunity to examine the entry site, practice rescue, and decline as appropriate, or
3. Provided by the employer by selecting a rescue team that is equipped and trained to perform the needed rescue services.

The respective “identified” host-facility in-house trained rescue team or outside rescue services will be notified to respond to the permit space to assist in retrieving an injured entrant. (Note: This language must be specifically stated in the contract agreement between the designated responder, host-facility operator and Apex Management.).

If the entry has the potential to be an IDLH atmosphere, rescue services must be either provided by the host facility or provided by an outside service which is given the opportunity to examine the entry site, practice rescue and decline as appropriate and are required to be on site for all IDLH conditions while work is being performed. All potential IDLH confined space entry must be approved by the Apex Manager, Corporate Health and Safety before entry is performed.



A documented, simulated rescue attempt will be performed by this crew as part of their established training regimen and at least annually thereafter if confined spaces are still required to be entered. This would enable the host-facility operator to evaluate and verify the prospective service(s) ability to respond in a timely manner based on the specific hazard(s) associated with each particular type of entry. A “qualified party” will conduct a performance evaluation of the simulated rescue attempt and critique this action to identify any deficiencies in equipment, training or personnel.

A quick survey of the rescued entrant will determine if first aid is required or professional medical assistance will be contacted. The trained rescue team members, **Authorized Attendant(s)** and **Entry Supervisor(s)** will be trained and certified to perform CPR and emergency first aid treatment before rendering assistance to rescued personnel. The **Entry Supervisor** will direct Apex Management or the host-facility Company representative to dial 911 emergency medical services if the need so arises.

Non-Permit Required Confined Spaces

However, it is anticipated that as set out in OSHA 1910.146 many confined spaces do not include hazard characteristics sufficient to be designated as Entry Permit-Required Confined Spaces. As such, entry into non-permit required (low hazard) confined spaces will require less stringent procedures including the following general precautions:

- Prior to work in an area, which could be classified as a confined space, a qualified individual such as the **EHS** specialist or trained **Project Manager**, will conduct a review and determine that the space does not require an entry permit;
- If a potentially hazardous atmosphere exists inside the confined space, continuous forced air ventilation must be used to ensure safe entry conditions are maintained;
- Continuous air quality monitoring is maintained to demonstrate that acceptable air quality is present;

- An **attendant** will be stationed outside the entry point. The attendant will maintain communication with the entrant(s) and summon assistance in case of an emergency; and
- The **attendant** will ensure that all workers exit the workspace safely.

References

- OSHA 29 CFR 1910.25, Portable Wood Ladders
- OSHA 29 CFR 1910.26, Portable Metal Ladders
- OSHA 29 CFR 1910.134, the Respiratory Protection Standard
- OSHA 29 CFR 1910.146, Permit Required Confined Space Entry
- OSHA 29 CFR 1915 Subpart B, Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
- AIHA Confined Space Information Website: http://www.aiha.org/committees/html/csc/index.html
- OSHA Confined Space Information Website: http://www.osha.gov/SLTC/confinedspaces/index.html
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)

LOCKOUT/TAGOUT (LOTO)

The completion of Apex's work tasks is not expected to include significant exposure to rotary equipment and machinery. However, if such equipment is present at job sites, Apex project personnel should stay clear of these items. Nevertheless, a program to control all potentially hazardous energy systems is established in accordance with the requirements of 29 CFR 1926.417 and 1910.147. Electrical hazard control will be performed by following the guidelines established in OSHA Regulation 29 CFR 1910.333.

The purpose of this program is to ensure that all energy sources that may include any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other potential energy must be stopped, isolated and locked and tagged out and prevented from discharging their energy before project personnel perform any servicing or maintenance operations. The person responsible for this program is an EHS specialist.

In general, the steps for completing the LOTO procedure include the following:

- Preparing for shutdown;
- Shutting down the machine or equipment;
- Isolation from the energy sources;
- Application of the LOTO device;
- Verification of proper isolation of energy source(s); and
- Return the LOTO equipment to service.

Roles and Responsibilities

Apex Companies, LLC Management has designated **authorized** employees who will perform contract work at host facilities.

When Apex employees are assigned to perform contract work at host facilities, they will not initiate this LOTO procedure, but instead participate in permitted work which complies with that particular host facility's LOTO Program.

Lockout/tagout will be used by the **employees** for their self-protection. Employees will be provided with personal color-coded, numbered locks, where no two are alike and each has its own unique key, as well as vinyl, weather/chemical resistant, imprinted, red/white/black colored tags that state, **"DO NOT OPERATE"**, and places for their name, date and type of work being performed.

Authorized employees are required to inform all **affected** employees, in person, **before** any LOTO devices are applied and **after** they have been removed from a machine or equipment that has been serviced or repaired. **Affected** employees only perform the duties of their job in an area in which the energy control procedure is implemented and servicing or maintenance operations are performed.

All **affected** employees, upon observing a machine or piece of equipment that is locked out/tagged out to perform servicing or maintenance, **shall not attempt to start, energize or use that machine or equipment.**

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Compliance

All Apex employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout/tagout. These **authorized** employees are required to perform the lockout/tagout in accordance with this procedure.

Training

Apex will provide certified training upon initial hiring, or transfer from affected status to authorized status. Retraining will be provided as required:

- Whenever there is a change in job assignments;
- A change in machines, equipment or processes that present a new hazard;
- A change in energy control procedures; and
- Whenever a periodic audit reveals inadequacies in employee knowledge and use of the energy control procedure.

Refer to the training section for LOTO training for both affected and authorized Apex personnel.

Periodic Inspections

Apex Management staff or host-facility operators will conduct documented annual or periodic inspections to assure the energy control procedures continue to be properly implemented and that the employees are familiar with their responsibilities. A review of the energy control procedure and employee responsibilities will be conducted with each authorized employee. This certification will identify the machine or equipment on which the energy control procedure was used, the date of inspection, the employee being inspected, and the person performing this inspection. (see form in Appendices entitled, **Lockout/Tagout Periodic Inspection Form**)

Identification of Equipment and Energy Sources

All relevant Apex machines or equipment with single source or multiple sources of power and stored energy must be identified and recorded. The host site is responsible for conducting evaluations on their own equipment. Annual review or periodic evaluations will determine if changes are necessary.

Sequence of Energy Control Procedure

Preparing for Shutdown

Notify all affected employees that a lockout/tagout system is going to be used and the reasons why. The authorized employee shall know the type of energy to be controlled on the machine or equipment and the hazards present.

Shutting Down the Machine or Equipment

If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, open toggle switch), or in a manner that reduces hazards from equipment stopping.

Isolation from the Energy Source(s)

Operate energy isolation device(s) (switch, valve, blind) so that the equipment or machine is isolated from its energy source. Stored energy must be dissipated by being bled off, restrained by blocking means, disconnected or otherwise rendered safe. Potential energy may include any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy. If the potential for a reaccumulation of stored energy exists, verification of energy isolation will be continued until service or maintenance has been completed, or this possibility no longer exists.

Application of Lockout/Tagout Device

An **Energy Isolation Logbook**, which is a record of LOTO events and equipment (assigned individual lock(s) and tag(s)) used to immobilize/identify energy isolating devices shall be maintained. Locks, where used, will be affixed in a manner that will hold the energy isolating devices in a “safe” or “off” position. If the equipment does not permit a locking device to be attached, a tag will be used instead, but it must be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock.

(Examples: remove isolating circuit element, block controlling switch, open extra disconnecting service.)

Verification of Proper Isolation of Energy Source(s)

After ensuring that no personnel are exposed, attempt to start up the deenergized machine or equipment to ensure proper disconnections were made. If start-up does not occur, then the equipment or machine has been successfully locked/tagged out. If start-up occurs, contact your immediate Supervisor/host-facility operator, review the **Lockout/Tagout Periodic Inspection Form** (see Appendices) Periodic LOTO Evaluation Report form (Form 10-2, Appendix A) (NOTE: these documents are also maintained by the host facility) and then repeat the sequence of energy control procedure. Return control positions to "off" or "neutral" status after the test.

After Servicing is Completed

Remove all servicing tools and testing equipment from the area and replace any removed guards. Ensure all employees are safely positioned or removed from equipment/machine area. Remove all lockout/tagout devices from each energy-isolating device by each employee who applied the device. Energize and proceed with testing. Deenergize and reapply control measures if the service or maintenance was unsuccessful as identified by testing. If successful, verify equipment/machine operational ability by initiating start-up procedures. This procedure should be documented as to who performs each procedure and who verifies that each procedure was completed in the proper order.

After testing and/or re-positioning attempts have been made, and if determined to be satisfactory, the equipment or machine is then returned to the control of the affected employee(s). Again, if unsuccessful, repeat isolation procedure(s) for further maintenance or repair.

Group LOTO

When multiple service groups or crafts are required to perform service or maintenance work on the same equipment at the same time, provisions will be made for all crafts to participate in a group lockout/tagout effort. The responsible person for the host-facility will initiate the group LOTO and the applied locking device will not be removed until written assurances and visual inspections have determined it safe to remove the controlling LOTO device.

Should an authorized personnel or shift change occur, the continuity of the LOTO shall be maintained at all times.

Locks will only be removed in cases where the authorized employee who applied it is not available. The Apex host-facility authorized personnel or Apex Management will only remove locks. Any employee who had their lock/tag removed will be notified by the authorized personnel performing the removal, prior to their returning to the work site.

Outside Personnel (Contractors)

Apex Management will inform all outside contractors of the elements of this program and ensure work efforts covered by this procedure are fully coordinated and observed.

Non-Applicable Situations

The company's hazardous energy control procedure **does not apply** for the following situations:

- While servicing or maintaining cord and plug connected electrical equipment, provided that the **equipment is unplugged** from the energy source and the **plug remains under the exclusive control** of the employee performing servicing or maintenance.
- Employees engaged in performing service or maintenance **tasks that do not expose** them to the unexpected start up of machines or equipment, energizing, or release of hazardous energy.

IF an employee must **either remove or bypass** machine guards or other safety devices, resulting in exposure to hazards at the point of operation, **OR** the employee is required to place any part of their body in contact with a point of operation of the operational machine or piece or equipment, **OR** the employee is required to place **any** part of their body into a danger zone associated with a machine operating cycle, **THEN the energy control procedure as outlined in this program MUST BE FOLLOWED.**

References

- OSHA 29 CFR 1926.417, Lockout and tagging of circuits
- OSHA 29 CFR 1910.147, The control of hazardous energy (lockout/tagout)
- OSHA 29 CFR 1910.333, Selection and use of work practices
- OSHA LOTO Information Website: http://www.osha.gov/dts/osta/lototraining/index.htm

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment is not a substitute for good engineering, administrative controls, or good work practices, but should be used in conjunction with these controls to ensure the safety and health of employees. Personal protective equipment will be provided, used, and maintained when it has been determined that its use is required and that such use will lessen the likelihood of occupational injury and illness.

OSHA requires employers to conduct inspections of all workplaces to determine the need for personal protective equipment (PPE) and to help in selecting the proper PPE for each task or job category at the site.

For each work site, a ***Hazard Assessment Form*** must be completed which lists the findings of the inspection and the specific protective equipment needed.

Project Managers should conduct a walk-through inspection of each work area to identify sources of hazards.

- impact,
- penetration,
- compression,
- chemical,
- heat,
- dust,
- electrical sources,
- and light radiation.

If the hazards can not be removed by engineering or administration controls and PPE has been identified, the project manager will determine:

- Suitability of PPE presently available or
- Select new or additional equipment, if needed.

Recognize the possibility of multiple and simultaneous exposure to a variety of hazards.

Each inspection documents (using the PPE Hazard Assessment Form),

- the workplace inspected,
- the person conducting the inspection,
- the work activities,
- potential exposures/hazards,
- PPE required to protect against the exposures,
- and date of the inspection.

The document must be signed and dated.

When these and other efforts are not feasible or are inadequate, PPE must be used. PPE includes any devices, clothing or work accessories designed to create a barrier against workplace hazards. Numerous hazard specific OSHA standards mandate the use of PPE.

PPE can be used for:

- Head protection (e.g., hardhats, helmets);
- Eye/face protection (e.g., safety glasses, face shields, goggles);
- Foot protection (e.g., safety shoes);
- Arm, hand and body protection (e.g., gloves, protective coveralls, aprons);
- Fall protection (e.g., safety harnesses);
- Hearing protection (e.g., ear plugs, muffs); and
- Respiratory protection (e.g., air purifying respirators).

The table below, "PPE Types to be Considered," lists of the types of PPE which may lend themselves to most Apex work operations.

No single combination of PPE can protect against all hazards. Thus, PPE should be used in conjunction with other protective measures. PPE itself may create significant hazards such as impaired vision, mobility, and communication; physical and psychological stress; and a false sense of security. Over-protection, as well as under-protection can be hazardous and should be avoided.

PPE TYPES TO BE CONSIDERED

PPE Types	PPE Types
Splash Apron Disposable Coveralls (For example, Tyvek) Coveralls, Cloth Disposable Hoods and Booties Ear Plugs Ear Muffs Face Shield Fall Protection Tripod Fall Protection Harness Welding Hood Welding Goggles Chemical Splash Suits Hardhats Long-sleeved Shirts	Half Facepiece Air Purifying Respirator Full Facepiece Air Purifying Respirator **Air Purifying Cartridges**: *Acid Gas, Ammonia, Dust/Fume/Mist, Organic Vapor (OV), OV/Acid Gas, OV/Dust/Mist, OV/Dust/Fume/Pesticide, and OV/Acid Gas/Dust* Safety Glasses Safety Work shoes Safety Work boots Gloves, Work Gloves, Nitrile Gloves, Latex Goggles

In addition, discussions with workplace supervisors and workers can be useful. Watch work activities being conducted, as well as discuss with personnel the details of their procedures, unusual or unobserved circumstances, any specific safety concerns they might have, or objections to protective measures to be instituted.

PPE Use and Maintenance

Reliance on PPE for protection against workplace hazards obligates project management to ensure that the equipment is properly used and maintained and that the PPE policies are effective and enforced. With few exceptions, fault would be found with project management and the responsible supervisor should a preventable injury occur to a worker who was "supposed" to be wearing PPE but wasn't. Simply making PPE available does not relieve management from implementing an effective PPE usage program which:

- Identifies responsibilities for administering and enforcing the PPE program;
- Clearly defines when and how PPE is to be inspected for adequacy, used, maintained, stored; and
- Details special training requirements for workers assigned PPE.

Training

Training must include the following:

- What PPE is necessary
- When the PPE is necessary
- How to properly put on, remove, adjust, and wear PPE
- The limitations of the PPE; and
- The proper care, maintenance, useful life and disposal of the PPE.

Each affected employee shall demonstrate an understanding of the training as well as the ability to use PPE properly, before being allowed to perform work requiring the use of PPE.

Certification of training for PPE is required by OSHA and shall be completed and documented to verify that each affected employee has received and understood the required PPE training. The documentation must include the name of each employee trained, and the date(s) of training. These records may be kept hard copy or electronic.

Retraining is required when:

- Changes in the workplace render previous training obsolete.
- Changes in the types of PPE to be used render previous training obsolete.
- Inadequacies in employees' knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.

References

- OSHA 1910.132, Personal Protective Equipment, General Requirements

BARRICADE AND TRAFFIC CONTROL PROGRAM

At Apex there may be occasional projects where access to road ways and/or railroad tracks becomes necessary. Hazards (especially prevalent at hazardous waste site investigations and cleanup operations) are associated with work in the proximity of moving/construction equipment/vehicles such as cranes, backhoes, drill rigs, forklifts, and bulldozers. Automobile and rail traffic through or near the job site provides Apex personnel with additional safety risks.

There are several methods to minimize moving equipment/vehicle hazards and to control traffic flow. Some of these include: movement (visual and/or sound) alarms on construction/moving equipment; spotters and/or signalers who track the movement of both equipment and personnel; and barricades.

Barricades and other traffic control devices promote traffic safety and efficiency by providing for the orderly movement of all road users on streets and highways. Traffic control devices notify road users of regulations and provide warning and guidance needed for the reasonably safe, uniform, and efficient operation of all elements of the traffic stream.

General

A barricade means an obstruction to deter the passage of persons or vehicles. Signs may be used to supplement barricade protection. Signs may also be used with barricades to warn of hazards and will be temporarily or permanently affixed or placed, at locations where hazards exist. In addition, barricades may be supplemented by tags (temporary signs), moving signs, signals, flashing lights or flagmen to warn of possible or existing hazards.

Barricades will be routinely used by Apex to protect employees and other individuals at project sites as a visual warning for employees. The primary means of barricading will be done by using tape and the Barricade Tape Program as described below. However, Apex employees may also utilize cones, fencing, barricades equipped with appropriate lights or reflectors and other means to block off access to potentially hazardous areas.

In general, all Apex equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment. Barricades for protection of employees will conform to the portions of the ANSI D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways related to barricades.

Examples of where barricades may be required on Apex projects include:

- All accessible areas within the swing radius of the rear of the rotating superstructure of a crane, whether permanently or temporarily mounted, in such a manner to prevent an employee from being struck or crushed by the crane;
- When mobile equipment is operating adjacent to an excavation, or when such equipment is required to approach the edge of the excavation, and the operator does not have a clear and direct view of the edge;
- Around entrances to confined spaces;
- Around blasting areas;
- “Regulated Areas,” or work areas having the potential for potentially hazardous chemical exposures, physical hazards, oxygen deficient or oxygen enriched atmospheres, where use of specific personal protective equipment precautions are mandatory;
- Around operating machinery, which has the potential for entangling personnel;
- At hazardous waste sites or emergency response sites, to designate separation of exclusion, contamination reduction and support zones;

- At any other work locations designated by Apex management to protect personnel from job hazards; and
- Along highways and railroad tracks where there is a potential for an employee to be struck.

Barricade Tape Program

Apex will use three different colored barricade tapes on its construction projects as a primary visual warning for its employees. It is important to note that barricade tape will not provide physical protection for floor or roof edges, floor openings, etc. and will not be used for physical protection. Apex uses "Yellow/Black", "Red" and "Magenta" tape for its Barricade Tape Program. Specific use of each type of tape is specified below.

Yellow/Black Barricade Tape

This tape will be used to serve as a caution to notify employees that a "Potential Hazard" exists. Apex employees may enter with caution, without permission from Apex or the customer, providing adequate personal protective equipment is worn.

The Yellow/Black barricade tape will be used for, but is not limited to the following:

- Identification of trip hazards;
- Identification of low hanging objects;
- Material storage areas; and
- Excavations less than four feet deep

Red Barricade Tape

Red tape will be used to indicate "Danger" and that potential serious hazard may be present. **NO EMPLOYEE**, other than that craft assigned to work inside a Red barricade, may enter without first obtaining permission from Apex or the customer. The only employees allowed to enter a RED barricade area will be that craft assigned to tasks by the Apex supervisor or manager responsible for the barricade.

The Red barricade tape will be used for, but not limited to the following:

- Live electrical components;
- Overhead work;
- Scaffold under construction;
- Blasting areas; and
- Around the swing radius of equipment with a rotating structure.

Magenta Barricade Tape

Magenta barricade tape will be used to indicate "Danger-Radiation". This tape will be used to warn employees that possible exposure may be present. The Magenta barricade tape is to be considered as an equal to Red, in that NO EMPLOYEES ARE ALLOWED to enter this area. The Magenta barricade tape will be used for, but not limited to the following:

- Representative of X-Ray work being performed. Signs must also be posted to protect areas where radiation operations are in progress; and
- Barricading areas of known radioactive contamination or materials.

Barricade Erection

Each Apex project supervisor or manager performing work that requires barricade tape to be erected will:

- Erect the tape to enclose the specific area to be protected only. The passageways or access ways should not be blocked, unless entirely necessary. If passageways or access ways must be blocked, contact the Apex project supervisor or manager for coordination with other crafts and/or possible alternatives;
- Erect tape in a secure and neat manner that will maintain a height between 40" and 45" from the ground surface or floor. A second row of barricade tape will be placed half the distance between the top row and the floor or ground;
- Arrange for removal of the tape; and
- The Barricade Tape Program will be reviewed with all Apex employees prior to implementing the program at the project site.

Traffic Control Near Rail Traffic

All required access to rail tracks and, or railways will be conducted in accordance with the transportation safety and protection procedures for both Apex and for the owner of the railroad lines.

References

- OSHA 29 CFR 1910.145, Specification for Accident Prevention Signs and Tags
- OSHA 29 CFR 1926.200, Accident Prevention Signs and Signals
- OSHA 29 CFR 1926.202, Barricades
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)
- American National Standards Institute (ANSI) D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways
- US Department of Transportation Federal Highway Administration (FHWA),
- Manual on Uniform Traffic Control Devices for Streets and Highways, 2003 Edition: http://mutcd.fhwa.dot.gov/HTM/2003/html-index.htm

All Apex personnel will be made aware of any forklift equipment provisions and their daily inspection and documentation requirements. An operational check will be conducted by each individual employee assigned to perform work using a powered industrial fork-truck.

The Project Manager will be informed of any hazards found by the inspecting employee that would render that equipment unsafe to operate. The equipment will be "tagged out of service" and the keys removed from use until authorized contract maintenance services correct the identified hazard(s). Inspection items include checking for the following:

- Secure overhead guard (roll cage)
- Load engaging device (uneven forks or cracks in heel)
- Mast cylinder hydraulics, attachment bolts and tight mast chains
- Operational warning horn or backup alarm
- Legible capacity plate (load limit data plate)
- Operational directional lighting (forward or reverse)
- Efficient braking mechanisms (foot and hand-operated parking)
- Tire conditions, secure lug nuts
- Fuel and power supply (connections, leaks, warning signals)
- Directional movement controls (gears, clutch, inching)
- Tilt, lift and side-shift controls operability
- Steering maneuvers (tight, firm control)
- Appropriate fluid levels (hydraulic, oil, brake, transmission, fuel)

General Operating Guidelines for Forklifts

While operating a forklift at most host facilities, employees can expect to encounter many possible hazards, including rough and irregular driving surfaces, blind spots, vehicular traffic, pedestrian traffic, and general work site obstacles. Safe operating procedures must be adhered to by following the guidelines:

- Always look in the direction you are traveling.
- Keep to the right whenever possible; never pass in an intersection.
- Always drive with a load only as high as necessary to clear ground obstacles.
- Arms and legs are never to be extended beyond the cab or sides of the vehicle or into the lift uprights.
- Always keep an eye out for overhead obstructions, other vehicles, pedestrians, vision obstructions, non-standard driving surfaces, loose objects on the ground, and changing environmental conditions.
- Avoid sudden starts and stops by driving under control always.
- Know the equipment load handling capacity and never exceed it, or use additional weight as a counterbalance. (**NOTE** - You can determine weight loads by asking a

Supervisor, more experienced coworkers, or checking the bill of lading or shipping manifest papers. DO NOT ATTEMPT to elevate the load to determine if the counterbalance is stable.)

- Determine the nature of your load, make sure it is secure, and adjust the forks appropriately to fit the maximum width of the pallet or load.
- Always check vehicle clearance before you turn to make sure there is enough room to clear the forks and rear-sway of your vehicle.
- Observe posted facility speed limits at all times.
- Always sound the horn when backing up or approaching pedestrians, other vehicles, and at cross aisles or any time vision is obstructed.
- Maintain a "three-truck length" safe following distance from other trucks, and follow established driving lanes or routes as marked.
- If your load is causing a vision obstruction, drive the vehicle backwards, or use an assigned "spotter" to see for you.
- Do not allow bystanders when stacking loads or when dealing with elevated loads.
- Riders are never allowed on your vehicle, in the cab or on the forks.
- The lift truck is never approved for personnel lifting by the forks.
- Never allow anyone to pass underneath the elevated portion of the truck, either loaded or unloaded.
- Always secure your load against the load backrest, and lower it to a safe ground clearance before changing directional movement or turning.
- Drive defensively; pedestrians always have the right of way.
- When parking your vehicle, always come to a smooth gradual stop, set the parking brake, fully lower the forks, and place all directional controls in neutral. (You will be required to turn the vehicle off if you move to a position where the vehicle is not in your direct view or you will be further than 25 feet away from the vehicle.)
- Unauthorized repair of lift trucks is a federal law violation, mechanical breakdowns must be reported and repairs made by authorized personnel.
- Refueling and propane bottle exchange areas are designated non-smoking locations.
- Stunt driving, horseplay, and speeding will not be tolerated.
- When loading or unloading trucks, ensure the parking brake on the trailer is set or the wheels chocked to prevent movement, and the bed of the trailer is in satisfactory condition to receive an intended load.
- Understand that the previously mentioned items are general guidelines and safe operating rules to be followed at all times. However, **this does not** constitute a formal forklift operator-training program. This training will consist of classroom instruction performed by contract safety services to include discussion, video presentation, course material review, written test, followed by a driving skills test performed on the host-facility grounds. Successful completion of these course requirements will license the approved

operator for an established time period. Certificates will be maintained in the employee **Personnel File**.

Forklift Inspection Program

Prior to every work-shift, Apex personnel will conduct a forklift inspection using the **Operator's Daily Checklist** (see Appendices). Forklift guards, hydraulics, gauges, and safety devices will be inspected prior to daily use.

Training

Apex employees who operate forklifts shall receive forklift training in accordance with 29 CFR 1910.178(l). Training shall consist of a combination of formal instruction, practical training and an evaluation of the operator's performance prior to assignment as a forklift operator. In addition, each operator must undergo a performance evaluation at least once every 3 years.

Formal forklift training will consist of a review and understanding of:

- Characteristics of the fork-truck(s) to be operated;
- Similarities to and differences from an automobile operation;
- Controls/instrumentation location, how they work, where they are;
- Power plant operation and maintenance;
- Steering and maneuvering;
- Visibility;
- Fork or attachment adaptation, operation, limitations of use;
- Vehicle capacity;
- Vehicle service brake and parking brake requirements;
- Vehicle inspection and maintenance;
- Refueling and recharging batteries;
- Operational limitations;
- Driving surfaces, ground conditions, obstacles;
- Load manipulation, stacking and un-stacking;
- Pedestrian traffic;
- Potentially hazardous environmental operating conditions;
- Ramps or sloped surface concerns on fork-truck stability; and
- Operating in closed environments with insufficient ventilation.
- Narrow aisle and restricted place operation.

Refresher training shall be provided when:

- The operator has been observed to operate the vehicle in an unsafe manner
- The operator has been involved in an accident or near-miss incident
- The operator is assigned to drive a different forklift
- A condition in the workplace changes that could affect the safe operation of the forklift

References

- OSHA 29 CFR 1910.178, Powered industrial trucks

ELECTRICAL SAFETY PROGRAM

Electricity is one of the most common occupational hazards. Apex personnel can be protected from electric shock hazards by various methods such as: guarding live parts, using insulation, over-current protection, and/or grounding. Guarding may be effected by using physical barriers between live conductors and workers and/or by keeping live parts out of reach from the working surface (known as "guarding by location"). Grounding is normally a secondary protective measure. When workers are working with electrical equipment, adherence to safe work practices is of primary importance to reduce the potential for electrocution or serious injury due to direct or indirect contact with energized equipment or circuits. Such safety-related work practices include applying LOTO, inspection, maintenance and using electrical protective devices such as insulating rubber gloves and mats, or live-line tools for both insulation and manipulation of energized parts from a distance.

This electrical safety program was written to satisfy a portion of the requirements of the OSHA Electrical Standard, 29 CFR 1910 Subpart S; and USACE EM-385-1-1. Refer to the most recent version of these standards for additional guidance on electrical safety.

Roles and Responsibilities

Project Personnel

Project personnel must look for and identify electrical hazards such as:

- Frayed cables;
- Exposed or uninsulated wiring;
- Uncovered openings in junction boxes;
- Disconnects;
- Motor control or switch centers;
- Ungrounded circuits;
- Temporary wiring and equipment used for construction-type activities without application of ground fault circuit interrupter (GFCI) protection; and
- Any other defects in electrical equipment.

Project personnel who face a risk of electrical shock will be trained and familiar with electrically related safety practices if their work brings them close enough to exposed parts of electrical circuits operating at 50 volts or more to ground.

Equipment operators must carefully scan for overhead electrical hazards prior to raising booms on cranes or any other equipment capable of coming into contact with electrical wires. If feasible, the energized power lines near masted or boomed equipment should be de-energized

prior to positioning the equipment, raising masts or booms, and beginning work operations. If such precautions are not feasible, then a minimum clearance distance of at least ten feet should be maintained from any energized power line.

Authorized Personnel

At Apex, only trained, qualified, and authorized personnel will be allowed to energize or de-energize electrical circuits and to perform work of an electrical nature on electrically driven equipment. These persons will perform safe-work practices and procedures to prevent electrical shock or other injuries resulting from either direct or indirect electrical contact. They will also use special testing equipment and techniques, personal protective equipment, insulating and shielding materials, and insulated tools while working on circuits or equipment that are or can be energized.

Electrical hazards, if found, must be reported to the appropriate Apex or client management representative and corrected in a timely fashion prior to the start of work operations.

Authorized personnel have been trained in and are familiar with the following items:

- Proper use and maintenance of electrical tools and equipment;
- Preventative measures to be taken to eliminate or minimize electrical hazards;
- Proper use and maintenance of personal protective equipment that will be used to minimize exposure to electrical hazards;
- Steps to take in case of an injury to oneself or to a coworker that involve electrical hazards;
- The skills and techniques necessary to distinguish exposed live electrical parts from other parts of electrical equipment;
- The skills and techniques necessary to determine the nominal voltage of exposed live electrical parts;
- The clearance distances specified in 29 CFR 1910.333c (these are listed in a forwarded section on authorized workers) and the corresponding voltages to which the qualified person may be exposed;
- Recognition of hazardous energy sources (electrical, mechanical, hydraulic, pneumatic, thermal, spring-loaded, etc.); and
- Methods and means necessary to control and isolate energy.

Documentation of this training is maintained by the EHS specialist.

Managers

Before drilling or digging in any outdoor work area, whether by hand or excavator, the responsible **manager** must first contact the local utility or other designated agency to obtain cable or pipeline location information and if appropriate, a digging permit.

General Program Requirements

Examination, Installation, and Use of Equipment

Electrical equipment shall be maintained free from recognized hazards that are likely to cause death or serious physical harm to Apex personnel. Frequent and periodic inspections by management, qualified/authorized personnel, and project personnel will be performed on a routine basis to establish and maintain safe working electrical conditions. Items for inspection should include:

- Identifying the work purpose and suitable electrical equipment needed (determined by classification type, size, voltage, and current capacity);
- Check for manufacturer's nameplate/label/descriptive markings; they must be legible and unaffected by environmental conditions;
- Determine mechanical strength and durability of enclosure parts;
- Observe heating effects under conditions of use;
- Observe any arcing effects under conditions of use;
- Insulation materials must be intact with no cuts, breaks, or incorrect splices; and
- Disconnecting/disengaging means are identified, intact, and functioning.

Identification of Disconnecting Means and Circuits

Each disconnecting means (breaker) for motors and appliances, as well as each service, feeder, and branch circuit at its disconnecting means or over-current device, **shall be legibly marked to indicate its purpose**, unless located and arranged so the purpose is evident. These markings shall be of sufficient durability to withstand the environment involved.

Overcurrent Protection

In the event an overload device or circuit breaker trips in a distribution panel or switch-gear room, the circuit breaker shall not be reset or returned to the "ON" position until the cause of the circuit breaker operation has been determined by qualified electrical personnel, or assigned host-facility personnel. Once the circuit has been tested and it is determined that it can be safely re-energized, then the circuit breaker may be reset and returned to the "ON" position, restoring electrical power to the circuit it was supplying. No materials may be stored inside or on any cabinet**.**

Protection of Conductors and Equipment

Access to a distribution panel, breaker box, switch gear, etc., is to be secured, protected, and signed or warned against accidental contact by personnel not trained or qualified to be in close proximity to live exposed electrical parts (any live part of electrical equipment operating at 50 volts or more). In locations where electric equipment would be exposed to physical damage, strong enclosures/guards shall be arranged to prevent damage. Clear workspace must be provided, at least 6 feet 6 inches high and 3 feet wide.

Grounding

A potential shock hazard exists when no third wire, grounding conductor, is used. If a fault occurs, most of the current will follow the path of least resistance, which is usually through a worker's hands or feet and then back to the ground. To prevent this, **all exposed non-current-carrying metal parts of cord and plug-connected equipment must be grounded by an approved system of double insulation**, (unless this equipment is supplied through an isolating transformer with an ungrounded secondary of not over 50 volts).

Electrical Continuity

Metal raceways, cable armor, and other metal enclosures for conductors shall be securely and metallically joined together into a continuous conductor and shall be so connected to all boxes, fittings, and cabinets to provide effective electrical continuity. The knockouts in cabinets, boxes, and fittings should be removed only if conductors are to be run through them. However, if a knockout is missing or if there is another hole in the box, the hole or opening must be closed. All interior wiring systems in metal raceways or enclosures shall be grounded at all times.

Approved Covers, Canopies

All pull boxes, junction boxes, and fittings shall be provided with tight-fitting covers approved for the purpose. If metal covers are used, they shall be grounded. In completed installations, each outlet box shall have a cover, faceplate, or fixture canopy. If flexible cord pendants pass through a box opening, they shall be provided with bushings on which the cords may bear.

General Illumination

Lamps for general illumination shall be protected from accidental contact or breakage. Protection shall be provided by elevation of at least seven feet from normal working surface or by a suitable fixture or lamp-holder with a guard. Employees may not enter spaces containing exposed energized parts unless illumination is provided that enables the employees to work safely. Protective shields, barriers, or insulating materials will be provided as necessary for employee protection.

Portable Illumination

Portable type hand-lamps (drop-cords) supplied through flexible cords shall be equipped with a handle of molded composition or other material approved for that purpose, and a substantial guard shall be attached to the lamp-holder or handle at all times.

Flexible Cords and Cables

Flexible cords and cables shall be protected from accidental damage. Sharp corners and projections shall be avoided. Where passing through doorways or other pinch points, flexible cords and cables shall be provided with padding or protection to avoid damage.

Hazardous (Classified) Locations

Apex does not currently conduct activities at hazardous classified locations. However, these areas may have the potential to exist while our employees are performing contract service work at host-facility locations. In the event this occurrence is realized, Apex personnel will follow all pertinent OSHA, USACE and client-specific guidelines.

Metallic Enclosures/Sheds

All metallic enclosures and frameworks for electrical equipment must be grounded. A grounding device should be of permanent construction and have the capacity to fault any current likely to be encountered. Where grounding cannot be implemented, due to some otherwise overriding requirement, steps must be taken to ensure that effective barriers, shields or warnings are in place.

Electrical Safety Related Work Practices

Although electrical equipment may comply with the installation requirements, when authorized personnel are working with electrical equipment, they must use safe work practices. Prescribed distances must be maintained, avoiding the use of electrical equipment when the employee and/or equipment is wet, and performing LOTO of equipment de-energized for maintenance.

Personnel must always regard all wires as live and dangerous, even if de-energized, if their source has NOT been locked or tagged out.

Working Under Overhead Lines

If work is to be performed near overhead lines, the lines should be de-energized and grounded, or other protective measures shall be provided before work is started. (This activity would normally be performed by Utility Company workers.) If protective measures are provided, such as guarding, isolating, or insulating, these precautions shall prevent employees from bodily contacting such lines directly or indirectly.

Unauthorized personnel working near overhead lines, whether in an elevated position or on the ground, will not approach a conductive object (an unguarded, energized line) closer than the following distances:

VOLTAGE RANGE (Kilovolts, kV)	MINIMUM SEPARATION DISTANCE
50 kV or less	10 feet
More than 50 kV	10 feet plus four (4) inches for every 10 kV over 50 kV

When **authorized personnel** are working near overhead lines, whether in an elevated position or on the ground, they will not approach or take any conductive object, without an approved insulated handle, closer to exposed energized parts than the following distances:

VOLTAGE RANGE (Volts, V; Kilovolts, kV)	MINIMUM SEPARATION DISTANCE
Less than or equal to 300 V	Avoid contact
Greater than 300 V but less than 750 V	12 inches
Greater than 750 V but less than 2 kV	18 inches
Greater than 2 kV but less than 15 kV	2 feet
Greater than 15 kV but less than 37 kV	3 feet
Greater than 37 kV but less than 87.5 kV	3.5 feet
Greater than 87.5 kV but less than 121 kV	4 feet
Greater than 121 kV but less than 140 kV	4.5 feet

Vehicular and Mechanical Equipment

Any Company vehicle or mechanized equipment (For example, man-lift) capable of having part of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased four inches for every 10kV over that voltage.

Bodily Contact with Conductive Materials

Any conductive materials or equipment that is in contact with any part of an employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If long dimensional conductive objects (pipes, rods, ducts) must be handled around exposed live parts, work practices to include guarding, insulating or safe material handling techniques will be used to minimize the hazard.

Portable Ladder Use

Any portable ladder used by an employee that could contact exposed energized parts shall have non-conductive side-rails (wood, fiberglass).

Wearing Conductive Articles

Conductive articles of jewelry or clothing **(watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear)** may not be worn if they might contact exposed energized parts, **unless** they are made non-conductive by means of covering, wrapping, or insulation.

Housekeeping Duties

Employees may not perform housekeeping duties at close proximity to exposed energized parts unless adequate safeguards (insulating equipment or barriers) are provided. Electrically conductive cleaning materials (steel wool, metalized cloth, or silicon carbide) may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.

Portable Electric Equipment Handling

Portable equipment shall be handled in a manner that will not cause damage, i.e., do not use the flexible cord to raise and lower the equipment. These flexible cords cannot be stapled or hung in a fashion that would damage the outer jacket or insulation.

Portable Electric Equipment Visual Inspection

Portable cord and plug connected equipment and flexible cord sets (extension cords) shall be visually inspected before use on any shift for external defects and for evidence of possible internal damage. If the equipment remains connected once it is put into place and is not exposed to damage, inspection is deferred until relocation occurs. To assure this inspection is completed and documented, the following program is being implemented in compliance with this regulation.

Energy Sources

All dangerous energy sources should be controlled and neutralized prior to maintenance and servicing work on energized systems, including running or stopped machines, pressurized systems and energized circuits, among others. Positive controls such as Lockout/Tagout should be applied to all such sources in accordance with the LOTO program described in Section 10.5 of this EHS Manual.

Construction Sites

In addition to the OSHA Occupational Health and Safety Standards (20 CFR 1910), electrical safety at construction sites is regulated by the Construction Safety Standards (29 CFR 1926). Refer to Section 10.10 of the EHS Manual for additional guidance on electrical safety at construction sites.

References

- OSHA 29 CFR 1910 Subpart S, the OSHA Electrical Standard
- USACE Safety and Health Requirement Manual, EM-385-1-1, Section 11

ELECTRICAL SAFETY PROGRAM FOR WORKERS ON CONSTRUCTION SITES

OSHA requires that ground-fault circuit interrupters (GFCI) or an Assured Equipment Grounding Conductor Program (AEGCP) be used on construction sites to protect Apex workers. With the wide use of portable tools on construction sites, the use of flexible cords often becomes

necessary. Hazards are created when cords, cord connectors, receptacles, and cord-and–plug-connected equipment are improperly used and maintained.

A flexible cord may be damaged by activities on the job, by door or window edges, by staples or fastenings, by abrasion from adjacent materials, or simply by aging. If the electrical conductors become exposed, there is a danger of electrical shocks, burns, or fire.

When a cord connector is wet, hazardous leakage can occur to the equipment-grounding conductor and to humans who pick up that connector if they also provide a path to ground. Such leakage is not limited to the face of the connector but also develops at any wetted portion of it.

GFCI or an AEGCP can be used successfully to reduce electrical hazards on construction sites. The following sections describe Apex's requirements and procedures for the use of either GFCI or an AEGCP at construction sites.

Ground-Fault Circuit Interrupters

GFCI will be used for personnel protection for all 120-volt, single-phase, 15 and 20 amp receptacle outlets on our construction sites, which are not part of the permanent wiring of the building or structure and which are in use by personnel.

It is important to note, however, that the GFCI will not provide worker protection from line-to-line contact hazards, such as a person holding two "hot" wires or a hot and a neutral wire in each hand. GGCI provide protection against the most common form of electrical shock hazard – the ground fault. GFCI also provides protection against fires, overheating and destruction of insulation on wiring.

Assured Equipment Grounding Conductor Program

This Apex procedure specifies the measures to be taken for implementing and maintaining an AECGP for all construction site activity and has been developed from 29 CFR 1926.404. An AEGCP is the preferred method, although OSHA permits the use of GFCI as an alternate procedure.

OSHA requires that a written description of our AEGCP, including the specific procedures adopted, be kept at the jobsite. Apex's AEGCP outlines specific procedures for the required equipment inspections, tests and test schedule.

The required tests must be recorded and the record maintained until replaced by more current records. The **Assured Equipment Grounding Conductor Program Test Record and Inspection Form**, will be used to record AEGCP tests and inspections (see Appendices). The written AEGCP description and the recorded tests must be made available, at the jobsite, to OSHA and to any affected employee upon request. Apex is required to designate one or more **competent persons** to implement the program per Apex project.

AEGCP Inspection Program

Electrical equipment must be visually inspected for damage or defects before each day's use. Each cord set, attachment cap, plug and receptacle of cord sets and any equipment connected by cord and plug, except cord sets and receptacles which are fixed and not exposed to damage, shall be visually inspected before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indications of possible internal damage. Equipment found damaged or defective must not be used by anyone until repaired. For each job site, record any conducted inspection on the **AEGCP Test Record and Inspection Form** (see Appendices).

AEGCP Testing Program

OSHA also requires two tests as part of the AEGCP program. These tests are to be performed on all cord sets, receptacles that are not a part of the permanent wiring of the building or structure, and cord-and-plug connected equipment required to be grounded.

Continuity Test

The first test is a continuity test for ensuring that all equipment-grounding conductors are electrically continuous. A simple continuity tester, such as a lamp and battery, bell and battery, an ohmmeter, or a receptacle tester can be used to perform the test.

Receptacle and Attachment Cap or Plug Test

The other test must be performed on receptacles and attached caps or plugs to ensure that the equipment-grounding conductor is connected to its proper terminal. This test can be performed with the same equipment used in the continuity test.

During testing, any equipment, which fails to pass the required tests, shall not be made available for use by employees and must be tagged out with a warning.

Tests performed must be recorded on Apex's **Test Record and Inspection Forms**, (see Appendices). This Test Record must include the identity of each receptacle, cord set, and cord-and-plug connected equipment that passed the test and shall indicate the last date it was tested or the interval for which it was tested.

These grounding tests are required:

- Before first use;
- After repairs before returning to service;
- After damage is suspected to have occurred, such as when a cord set is run over; and,
- At intervals, not to exceed three months, except that cord sets and receptacles which are fixed and not exposed to damage, must be tested at regular intervals not to exceed six months.

AEGCP Outlet Requirements

The AEGCP must ensure that outlet devices have an ampere rating not less than the load to be served and must comply with the following requirements:

- Single receptacles: A single receptacle installed on an individual branch circuit must have an ampere rating of not less than that of the branch circuit.
- Two or more receptacles: Where connected to a branch circuit supplying two or more receptacles or outlets, receptacle ratings shall conform to table 10-2.
- Receptacles use for the connection of motors: The rating of an attachment plug or receptacle used for card-and-plug connection of a motor to a branch circuit shall not exceed 15 amperes at 125 volts or 10 amperes at 250 volts if individual overload protection is omitted.

RECEPTACLE RATINGS FOR VARIOUS SIZE CIRCUITS

CIRCUIT RATING AMPERES	RECEPTACLE RATING AMPERES
15	Not over 15
20	15 or 20
30	30
50	50
40	40 or 50

AEGCP Inspection and Marking System

Color Code and Inspection Schedule

Apex project managers will use a color-coded tape or color-coded tyraps to indicate the frequency for periodic inspection of construction electrical tools and equipment. **It is the responsibility of Apex personnel using the tools and equipment to ensure that the markings remain on the tools or equipment before inspections.** Refer to Table 10-3 for the color codes and corresponding scheduled inspection periods for the AEGCP.

AEGCP COLOR CODE AND INSPECTION SCHEDULE

COLOR CODE	INSPECTION MONTH
White	January
White plus yellow	February
White plus blue	March
Green	April
Green plus yellow	May
Green plus blue	June
Red	July
Red plus yellow	August
Red plus blue	September
Orange	October

COLOR CODE	INSPECTION MONTH
Orange plus yellow	November
Orange plus blue	December

In addition to the Color Code and Inspection Schedule, **quarterly inspections on all portable electrical hand tools, all electrical equipment, cord sets, and adapters will be conducted using an approved tester in conjunction with a visual inspection.** The visual inspection will include:

- Inspecting the electrical cord for worn or cracked insulation;
- Checking the plug prongs for damage;
- Checking the plug for exposed connectors;
- Inspecting the cord entry to plug and tool housings for worn or frayed insulation and strain relief;
- Checking for excessive oil or other potentially conductive buildups on electrical equipment; and
- Inspecting the equipment housing for signs of damage.

AEGCP Voltage Tester or Measurement Device Inspections

Voltage testers or measurement devices will be inspected on a quarterly basis. The electrical test method for inspecting voltage testers or measurement devices will include testing live AC and DC voltage. When any electrical testing is conducted, personal protective equipment will be worn.

The visual inspection must include, at a minimum:

- Inspecting the housing and the readout window for cracks, loose screws, and other deficiencies; and,
- Inspecting electrical leads for signs of wear, discoloration and faulty connections at probes.

Double Insulated Hand Tool Inspections

Double insulated portable hand tools should be used in potentially hazardous environments. These tools must have the Underwriters Laboratories' ***Double-Insulated*** label and the tools must be of heavy-duty construction. Inspection for double insulated portable hand tools must be completed on a quarterly basis. The inspection must include a visual inspection, as outlined previously, and include the following electrical tests:

- A Multi-Amp Test: accomplished by connecting two leads on any clean metal points on the equipment housing. One lead is connected into the black receptacle on the test set (simulating the third wire), the other lead into the white receptacle (which is the same as the grounding cradle on the tester). Any leakage current present is indicated as a

"power ground". During the same test, a line-to-line short circuit anywhere in the equipment, line cord, or switch will be indicated as a "short circuit."

- Once the Multi-Amp tests are completed, verify that the Ground Fault Circuit Interrupter (GFCI) works properly using a GFCI tester. Remove the GFCI tester and plug in the double-insulated tool. If the GFCI trips with the tool running, the hand tool failed the GFCI test.

If the tool fails either test, it should be tagged or marked as "Defective", taken immediately out of service, repaired or replaced.

Permanently Wired Shop Equipment Inspections

In the case of permanently wired shop equipment at Apex project sites, semi-annual inspections will be conducted. This inspection must include the following:

- Inspecting for proper overload protection;
- Inspecting the continuity of ground;
- Inspecting mechanical operations of the switch;
- Inspecting limit switches;
- Inspecting interlocks;
- Inspecting for broken plugs and outlets/sockets;
- Inspecting for frayed electrical cords;
- Inspecting for discoloration on any part of equipment; and
- Inspecting flexible conduit and connectors.

If office equipment is in use at the project site, office equipment must also be inspected on a semi-annual basis. Because certain testing equipment can damage more sensitive electronic components in office equipment, such as video display terminals and computers, only a visual inspection is required.

References

- OSHA 29 CFR 1910 Subpart S, the OSHA Electrical Standard
- OSHA CFR 1926.404, Wiring Design and Protection
- 29 CFR 1926.416, Safety and Health Regulations for Construction - Electrical
- OSHA Electrical Hazards in Construction Website: http://www.osha.gov/SLTC/etools/construction/electrical_incidents/mainpage.html

FIRE PREVENTION AND FIRE EXTINGUISHER PROGRAM

This objective of this program is to establish the criteria for fighting fires by personnel at Apex and at Apex job sites.

Roles and Responsibilities

The provisions of this program are applicable to all Apex personnel. This program applies to all personnel (consultants, agency, contractors, and subcontractors - full and part-time) who work with or whose job responsibilities require them to be familiar with the fire prevention and fire hazards, whether they work at Apex or on a Apex job site.

Apex management will review and evaluate this program regularly or when operational changes at a job site occur that require revision.

Fire Prevention and Minimization

Hazard Determination and Communication

The following fire hazards, prevention measures, and safety precautions should be followed by Apex personnel:

- Consideration must be given to storage and use of flammable liquids, combustible materials, construction material, and locations of welding or other spark-producing or open-flame processes;
- All means of exit should be located and communicated to all personnel; and
- All means of fire protection should be located and communicated to all personnel.

Engineering Controls

Sprinkler systems, stand pipes, fire extinguishers, small hose systems, alarm systems, foam systems and employee training serve as engineering controls. Additional controls include the storage of flammable and combustible liquids and materials in approved containers, approved site-specific emergency evacuation plans, and communication with local emergency response preparedness teams.

Administrative Controls

Regular inspections shall be conducted by the EHS specialist and/or Designated Person for the proper maintenance and care of all fire fighting equipment and proper storage of all flammable materials.

General Fire Prevention Measures

Apex management has the responsibility to ensure that hazardous accumulations of combustible materials are controlled so that a fast developing fire, rapid spread of toxic smoke or an explosion will not occur.

Prevention is the best fire protection measure.

Some of the preventative measures that Apex personnel should employ are:

- Report and repair all flammable liquid or gas leaks immediately. If immediate repairs are not possible, post an adequate warning sign, isolate the area and take extra precautions against fire;

- In the event of a flammable liquid or gas leak, extinguish all fires and remove other sources of ignition immediately. Shutdown engines and other potential sources of ignition, such as pilot lights. Report the leak promptly to the manager in charge. Shut off fuel supply or process if possible;
- Fires and open flame devices shall not be left unattended;
- Use gasoline as a motor fuel only. Using gasoline as a cleansing agent on Apex job sites is strictly forbidden. Use a high flash point (140º+ F) safety solvent to clean tools, machinery and other similar equipment. Wear gloves made of hydrocarbon-resistant rubber to protect hands;
- Keep all buildings in which solvents or chemicals are being handled well ventilated at all times;
- Transport flammable liquid only in approved, clearly marked safety containers. Any volatile liquids should be stored in containers made for their purpose. Never place flammable liquid containers inside car or truck passenger compartments;
- Unplug electric coffee pots, hot plates, and like appliances at the end of each work day;
- Turn off electrical equipment when not in use and at the end of the work day;
- Avoid overloading electric circuits;
- Extension cords are a hazard when stapled, run under rugs, or through doorways. Request additional circuits;
- Use portable electric heaters with great care. Avoid placing such appliances near combustibles. Unplug electric heaters at the end of the work day;
- Be careful that light bulbs do not come into contact with combustibles in storage areas;
- Smoking is only permitted in designated safe areas; and
- Do not discard smoking materials into wastebaskets at any time. Dispose of smoking materials in designated smoking area buckets only.

Fire Extinguishing Equipment

Management must make fire extinguishers available throughout Apex job sites. It is imperative that personnel be familiar with the location and proper use of all fire fighting equipment. Regular inspections of this equipment shall be made by a EHS specialist to ensure that all units are functional and that all fire extinguishers contain a full charge.

Out of Service Equipment

Non-functioning fire fighting equipment should be clearly marked “out of service.”

Replace all fire extinguishers immediately upon removal from service so that an adequate quantity is available for use, including service for recharging, inspection or replacement.

Fire Fighting

Once a fire is deemed to be beyond the incipient (initial) stage, all personnel should evacuate the job site, following established evacuation plans.

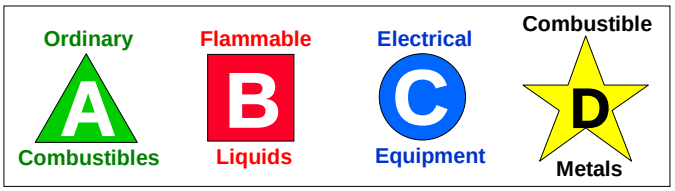
Unless you are trained to fight a fire, your only duty can be to sound the alarm and save your life. In case of fire, the following procedure should be used:

- **Summon help**. Do not fight a fire before alerting someone else;
- Analyze the situation, considering:
- Is there a threat to life?
- Damage to public property?
- Evacuate or is extinguishing the fire possible?
- Do you have a safe exit to your rear if the attempt to extinguish the fire is unsuccessful?
- Is notification and assistance from outside authorities appropriate?
- Are hazardous or toxic chemicals present?
- **Isolate all fuel sources** and/or threatened facilities; and
- Locate the appropriate fire fighting extinguisher/equipment (the type of fire extinguishers must be appropriate for type of fire to be extinguished);

The type of fire extinguisher must be appropriate for type of fire to be extinguished.

Classification of Fires:

Class A Fire – Paper, wood, etc.;
Class B Fire – Flammable or combustible liquids;
Class C Fire – Electrical; and
Class D Fire – Metals.



Approach the fire from the upwind direction;

Use the extinguisher, following the acronym PASS:

- **P** ull the pin on the top of the unit;
- **A** im at the base of the fire;
- **S** queeze the handle on the top of the unit;
- **S** weep the extinguishing media along the base of the fire until the fire is out; and

- Ensure that the fire is fully cooled before assuming it is completely extinguished.

Building Fires

In the event of a fire beyond "insipient stage" or the capability of personnel using fire extinguishers, or involving treatment chemicals or contaminants, the following actions shall be taken:

- Evacuate all personnel to an area upwind of the building;
- Notify the local Fire Department; and
- Notify an Apex EHS specialist.

Chemical Fires

Fires involving chemicals are considered beyond the capabilities of Apex personnel. In the case of a chemical fire, all personnel shall evacuate to an upwind location and notify the local Fire Department.

Fire Extinguisher Training

Apex personnel who are OSHA Hazardous Waste Operations (HAZWOPER) trained shall receive fire extinguisher training in accordance with 29 CFR 1910.157(g). Training shall be provided at annually and shall include:

- The general principals of fire extinguisher use;
- The hazards involved with incipient stage firefighting; and
- The types, proper use, inspection and maintenance, of fire extinguishers, fire hoses, stand pipes, sprinkler systems, foaming systems and alarm systems.

Additional information will be covered in site-specific emergency response training and site drills.

Record Keeping

Proper record keeping is as important as the inspection, maintenance and recharging of all fire fighting equipment. Fire fighting equipment must have a tag or label securely attached that indicates the month and year the maintenance recharging or testing was performed and identifies the person performing the service. At least monthly, record the date the inspection was performed and the initials of the person performing the inspection. In addition to the required tag or label, a permanent file record for each piece of fire fighting equipment shall be maintained for thirteen months. This record file must show:

- Maintenance date;
- Name of the person or agency performing the maintenance;
- Date of last recharge;
- Name of the person or agency performing the hydrostatic test;
- Description of dents remaining after passing a hydrostatic test;
- Date of last testing;

- Water pressure (applicable to stand pipes and sprinklers); and
- Third party testing (annually) on all fire fighting equipment.

References

- OSHA 29 CFR 1910.106, Flammable and Combustible Liquids
- OSHA 29 CFR 1910.155-165, 1910 Subpart L, Appendix A-E.

WALKING AND WORKING SURFACES

Housekeeping

Apex will keep all places of employment, passageways, storerooms, and service rooms clean and orderly and in a sanitary condition. Walkthrough inspections should be performed on a daily basis by the supervisor or manager of the operation. The floors of every workroom will be maintained in a clean and dry condition, as work conditions permit. Where wet processes are used, drainage will be maintained, and false floors, platforms, mats, or other dry standing places should be provided where practicable. To facilitate cleaning, every floor, working place, and passageway will be maintained free from protruding nails and screws, splinters, holes or loose boards.

Slips, trips and falls cause:

the majority of general industry accidents
15 percent of all accidental deaths
more fatalities than all other causes but motor vehicles

OSHA's standards for walking and working surfaces apply to all permanent places of employment, except where only domestic, mining, or agricultural work is performed.

General Requirements:

Workplaces must be kept clean, orderly, and sanitary
Workroom floors must be maintained as clean and dry as possible

Some of the most frequently cited violations in Subpart D involve housekeeping

Aisles and Passageways

Where mechanical handling equipment is used, sufficient safe clearances will be maintained for aisles, at loading docks, through doorways and wherever turns or passage must be made. Aisles and passageways will be maintained so that they remain clear and in good repairs, without obstruction across or in aisles that could create a hazard to personnel. If an aisle or passageway is permanent, it will be marked by tape, paint or other appropriate means.

Covers and Guardrails

Apex will provide covers and/or guardrails to protect employees from hazards of open pits, tanks, vats, ditches, etc.

Floor Loading Protection

Loads approved by the building official will be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building, or authorized agent, in a conspicuous place in each space to which they relate. Such plates will not be removed or defaced but, if lost, removed, or defaced, will be replaced by the owner or authorized agent. The floor loads must be permanently marked stating maximum floor load.

Apex employees or other personnel will not place, or cause, or permit to be placed, on any floor or roof of a building or other structure a load greater than that for which such floor or roof is approved by the building official.

Guarding Floor Openings

Apex requires that every stairway floor opening be guarded by a standard railing (railing constructed according to 29 CFR 1910.23 (e)). The railing will be provided on all exposed sides, except at an entrance to a stairway. For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing, a hinged floor opening cover of standard strength and construction and removable railings on all exposed sides, except at an entrance to a stairway will be used.

Every ladderway floor opening or platform will be guarded by a standard railing with standard toeboard on all exposed sides, except at an entrance to an opening, with the passageway through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

Apex requires that every hatchway and chute floor opening be guarded by one of the following:

- Hinged floor-opening cover of standard strength and construction equipped with standard railings or permanently attached leaving only one exposed side. When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate positions by removable standard railings.
- A removable railing with toeboard on not more than two sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railings will be kept in place when the opening is not in use.
- Where operating conditions necessitate the feeding of material into a hatchway or chute opening, protection will be provided to prevent employees from falling through the opening.

Every skylight floor opening and hole will be guarded by a standard skylight screen or a fixed standard railing on all exposed sides.

Infrequently used pit and trapdoor floor openings or manhole floor opening will be guarded by a floor opening or manhole covering of standard strength and construction. While the cover is not in place, the opening will be constantly attended by someone or will be protected on all exposed sides by removable standard railings.

Every temporary floor opening will have standard railings, or will be constantly attended by someone. Every floor hole into which persons can accidentally walk will be guarded by either:

- A standard railing with standard toeboard on all exposed sides, or
- A floor hole cover of standard strength and construction, a removable standard railing, or will be constantly attended by someone.

Every floor hole into which persons cannot accidentally walk, on account of fixed machinery, equipment, or wall, will be protected by a cover that leaves no openings more than one inch wide. The cover will be securely held in place to prevent tools or materials from falling through.

Where doors or gates open directly on a stairway, a platform will be provided, and the swing of the door will not reduce the effective width to less than 20 inches.

Fixed Industrial Stairs

Apex requires that fixed stairs be provided for access from one structure level to another where operations necessitate regular travel between levels, and for access to operating platforms at any equipment, which requires attention routinely during operations. Fixed stairs will also be provided where access to elevations is daily or at each shift for such purposes as gauging, inspection, regular maintenance, etc., where such work may expose employees to acids, caustics, gases, or other harmful substances, or for which purposes the carrying of tools or equipment by hand is normally required. Spiral stairways will not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway. Winding stairways may be installed on tanks and similar round structures where the diameter of the structure is not less than five (5) feet.

Fixed stairways will be designed and constructed in accordance with 29 CFR 1910-24 and will be installed at angles to the horizontal of between 30º and 50º. Refer to Table D-1 in 29CFR 1910.24 (e), Fixed Industrial Stairs, to obtain appropriate rise/tread dimensions. In addition stairway platforms will be no less than the width of a stairway and a minimum of 30 inches in length measured in the direction of travel.

In accordance with 29 CFR 1910.24(f) all stair treads will be reasonably slip-resistant and the nosings will be of nonslip finish. Rise height and tread width will be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs.

Standard railings will be provided on the open side of all exposed stairways and stair platforms. Handrails will be provided on at least one side of closed stairway, preferably on the right side

descending. Stair railings and handrails will be installed in accordance with provisions of 29 CFR 1910.23.

Vertical clearance above any stair tread to an overhead obstruction will be at least seven feet measured from the leading edge of the tread.

Scaffolding

General Requirements:

- Must be capable of supporting four times the maximum intended load.
- Do not alter or move while in use
- Protect workers on scaffolds from overhead hazards
- If higher than 10 ft., use guardrails, midrails, and toeboards
- Use wire mesh between the toeboard and midrail if people work or pass underneath
- Must be equipped with access ladder or equivalent.

References

- OSHA 29 CFR 1926.25 – Housekeeping
- OSHA 29 CFR 1910 Subpart D – Walking and Working Surfaces
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)

MOTOR VEHICLE SAFETY PROGRAM

This program provides guidance for protection of Apex personnel engaged in motor vehicle operations or who work in areas where motorized vehicles are encountered. **This program applies to Apex owned or rented motor vehicles and client owned vehicles that Apex personnel operate on or off the highway.** Company vehicles used for business purposes on public roadways must meet all requirements for motor vehicle operations in the state the vehicle is operated in.

Apex project managers are responsible for ensuring that the guidelines in this program are followed when personnel are assigned as principle operator of a motor vehicle.

Requirements for Motor Vehicle Operators

Apex personnel must meet the following minimum requirements to operate a motor vehicle:

- Personnel must have a valid state/county driver's license;
- Personnel must be physically able to operate a motor vehicle safely;
- Personnel must be mentally alert to operate a motor vehicle safely;
- Personnel must display a responsible attitude;
- Personnel must get familiar with the motor vehicle they will operate prior to operating the vehicle;

- Personnel must not talk on a cellular phone and drive at the same time unless using a "hands-free" cellular phone;
- Personnel must carry their valid drivers license at all times while driving a motor vehicle;
- Personnel will not operate a company or client vehicle on or off the project site after their license has been revoked, suspended or otherwise affected;
- Personnel will immediately notify their supervisor if involved in a motor vehicle accident or if their license has been revoked or suspended. Disciplinary action will be taken, which could result in termination of employment, if personnel fail to notify their supervisor;
- Personnel in motor vehicles as a passenger or driver, will wear shoulder harnesses and seat belts at all times;
- No more than three personnel will be permitted to ride in the front seat of a motor vehicle;
- All vehicles used by Apex personnel will have seats that are firmly secured and adequate for the number of passengers being transported; and
- Tools and other materials stored in vehicles will be secured to prevent movement, which could pose a safety hazard.

Motor Vehicle Inspections

Apex personnel will check their vehicles and associated equipment at the beginning of their shift to ensure that the motor vehicle and associated equipment are in safe operating condition and free of apparent damage that could cause failure while in use. The **Motor Vehicle Inspection Checklist** (see Appendices) will be used. All defects will be corrected before placing the motor vehicle or associated equipment in operation.

Motor Vehicle Operation

Whenever possible, motor vehicles will be operated without obstructed rear views from the driver's seat. If a motor vehicle has an obstructed rear view due to the construction of the vehicle or load, the vehicle will not be operated in reverse gear unless the vehicle has a reverse signal alarm that is audible above the background noise level and/or an observer, who has been specifically assigned as an observer, signals that it is safe to operate in reverse gear.

The EHS specialist must retain copies of valid driver licenses of all Apex personnel who are required to operate motor vehicles. The EHS specialist will verify personnel driver licenses on an annual basis to ensure that all driving personnel have a valid motor vehicle driver's license.

Guidelines for Cellular Phone Use while Driving

Apex has included some accident prevention guidelines for personnel who carry a cellular phone in their car. These guidelines should be followed by all Apex personnel. The guidelines will help to minimize the potential for an automobile accident due to the driver becoming distracted while using the cell phone:

- The preferred approach is for personnel to safely pull off the road when making or receiving a call;
- When a passenger is in the car, the passenger should answer incoming phone calls;
- Leave the phone in the less distracting vibration mode while traveling, periodically pulling over to stop to check for messages and return calls.
- All conversations on a cell phone should be suspended when entering work zones, approaching locations that have high pedestrian traffic, while in heavy traffic, on winding or narrow roads, and during severe weather conditions.
- Drivers should know the state and local regulations regarding the use of cell phones while driving. Some states impose restrictions and fines for cellular phone use while driving.

References

No references for this section.

IMMINENT DANGER CONDITIONS

In the event that an EHS specialist or other Apex personnel discovers an imminent danger condition or a severe violation of project guidelines with a potential for direct impact on workers' safety, they shall immediately report it to the Apex project manager or the appropriate responsible client designated representative. If work is being conducted, a stop work order shall be issued and the area secured until the hazard is abated.

Examples of imminent danger conditions or severe violations of project specifications include, but are not limited to:

- Working within an asbestos containment area without using required protective clothing and/or respiratory protection;
- Working in areas containing hazardous substances at IDLH concentrations;
- Using unsafe scaffolding with unsecured or insufficient planking or without railing;
- Working on elevated work platforms (higher than six feet) without railing or fall protection;
- Using flammable or combustible liquids in the vicinity of ignition sources;
- Working within an asbestos containment area without maintaining prescribed negative pressure (HEPA) ventilation;
- Entering and working inside a confined space without performing the required pre-entry air quality testing, lockout/tagout, ventilation of the space and (if applicable) completion of an entry permit;
- Performing servicing or maintenance operations on energized systems (mechanical, electrical, fluid) without implementation of lockout/tagout (LOTO) procedures and application of LOTO devices;

- Using masted or boomed equipment closer than ten feet from energized power lines;
- Conducting excavation/trenching activities without a valid and accurate subsurface utility markout; and
- Entering excavations greater than four feet deep without proper trenching or shoring, and without evaluating for a hazardous atmosphere.

Apex personnel have the responsibility and authority to stop any unsafe job or unsafe task being conducted and shall immediately request Project Manager/EHS involvement to resolve the issue. The employee's judgment call, when made in good faith and using good judgment, shall be considered commendable even though the conclusion of the investigation might be found to the contrary.

References

No references for this section.

EARTH MOVING, EXCAVATION, TRENCHING AND SHORING

This program outlines procedures and guidelines for the protection of employees working in and around excavations and trenches. This program requires compliance with OSHA Standards described in Subpart P (CFR 1926.650) for the construction industry.

Compliance is mandatory to ensure Apex personnel protection when working in or around excavations.

The programs in this manual and any other safety programs or procedures deemed essential for worker protection, are to be used in conjunction with this program.

The planning process for an excavation job should start with a study of pre-excavation conditions such as superimposed loads, soil structure and classification, hydrostatic pressure, and the location of underground utilities. From such a study, it will be possible to evaluate potential hazards as well as changes that might occur and to effectively plan appropriate control measures. The use of **excavation permits** is an effective tool for ensuring that necessary precautions are taken to control hazards, protect workers and comply with OSHA's excavation standard.

Key elements of an effective excavation hazard control plan include:

- Determine the factors and characteristics affecting the type of excavation operations;
- Based on the depth, location, and other factors associated with the planned excavation/trench, determine the appropriate protective measures;
- Ensure that trenches exceeding five feet in depth are adequately shored, stepped or sloped;
- Barricade all excavations/trenches to prevent personnel and animals from falling into them;
- Designate and train a **competent person** to approve the safeguards implemented for all excavations/trenches; and
- Provide for air quality testing for all excavations/trenches where the potential for encountering a hazardous atmosphere exists.

Roles and Responsibilities

It is the responsibility of each supervisor to implement and maintain the procedures and steps set forth in this program. All employees working in and around the excavation must be trained in the recognition of hazards associated with trenching and excavating. Each employee involved with excavation and trenching work is responsible to comply with all applicable safety procedures and requirements of this program.

The **competent person** assigned to any excavation/trenching activities provides oversight and collects data to determine the effectiveness of protective systems, PPE and personnel safety. The **competent person** must be trained in accordance with the most recent version of the OSHA Excavation Standard, and all other programs that may apply (examples Hazard Communication, Confined Space, and Respiratory Protection), and must demonstrate a thorough understanding and knowledge of the programs and the hazards associated.

All other employees working in and around the excavation must be trained in the recognition of hazards associated with trenching and excavating.

General Requirements

Before any work is performed and before any employees enter the excavation, a number of items must be checked and insured:

- Underground utility locations must be determined. Verification of utility locations will be conducted by the **competent person**. This can be accomplished by either contacting local utility companies or the local "one-call' center for the area;
- All overhead hazards (surface encumbrances) that create a hazard to employees must be removed or supported to eliminate the hazard;
- A **competent person** will inspect all excavations and trenches daily, prior to employee exposure or entry, and after any rainfall, soil change, or any other time needed during

the shift. All inspections will be documented on the **Daily Excavation Inspection and Entry Form** and kept on file in the jobsite safety files and forwarded to the **Project Manager** weekly (see Appendices). The competent person must take prompt measures to eliminate any and all hazards;

- Excavations and trenches that have the potential for toxic substances or hazardous atmospheres will be tested at least daily by the **competent person**. A log of the test results must be kept at the work site;
- Adequate protective systems will be utilized to protect employees. This can be accomplished through sloping, shoring, or shielding (See Following Sections);
- If a trench or excavation is four feet or deeper, stairways, ramps, or ladders will be used as a safe means of access and egress. For trenches, the employee must not have to travel any more than 25 feet of lateral travel to reach the stairway, ramp, or ladder;
- Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails, which comply with 1926.502(b), shall be provided where walkways are six feet or more above lower levels;
- There must be an **excavation safety plan** developed to protect employees;
- Workers must be supplied with and wear any PPE deemed necessary to assure their protection;
- Employees shall not work in excavations in which there is accumulated water, or in excavations, in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.
- If water is controlled or prevented from accumulating by the use of water removal equipment, a **competent person** must ensure proper operation and shall monitor the water removal equipment and operations.
- All spoil piles will be stored a minimum of two (2) feet from the sides of the excavation. The spoil pile must not block the safe means of egress.
- No Apex employee shall be permitted underneath loads handled by lifting or digging equipment. Workers shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any falling materials.
- For exposure to public traffic, the employees shall be provided reflective vests.

Excavation Safety Plan

An excavation safety plan is required in written form. This plan is to be developed to the level necessary to insure complete compliance with the OSHA, USACE, state, and local safety standards.

Excavation Safety Plan Components:

- Utilization of the local one-call system;
- Determination of locations of all underground utilities;
- Consideration of confined space atmosphere potential;
- Proper soil protection systems, PPE, and clothing;
- Determination of soil composition and classification;
- Determination of surface water and depth to groundwater;
- Depth and width of the excavation and length of time it will remain open; and
- Proper adherence to any other coinciding safety programs.

Rock and Soil Stability Classification and Identification

The OSHA Standards define soil classifications within the Simplified Soil Classification Systems, which consist of four categories: Stable rock, Type A, Type B, and Type C. Stability is greatest in stable rock and decreases through Type A and B to Type C, which is the least stable. Appendix A of the OSHA Excavation Standard provides soil mechanics terms and types of field tests used to determine soil classifications.

Soil Test and Identification

The **competent person** will classify the soil type in accordance with the definitions in Appendix A of the OSHA Excavation Standard, on the **basis of at least one visual and one manual analysis**. These tests should be run on freshly excavated samples from the excavation and are designed to determine stability based on a number of criteria: the cohesiveness, the presence of fissures, the presence and amount of water, the unconfined compressive strength, the duration of exposure, undermining and the presence of layering, prior excavation and vibration.

The competent person will perform several tests of the excavation to obtain consistent, supporting data along its depth and length. The soil is subject to change several times within the scope of an excavation and the moisture content will vary with weather and job conditions. The competent person must also determine the level of protection based on what conditions exist at the time of the test, and allow for changing conditions.

Excavation Protection Systems

The three basic protective systems for excavations and trenches are sloping and benching systems, shoring and shields.

Exceptions to using protective systems include:

- Excavations that are made entirely in stable rock; and,
- Excavations are less than five feet deep and declared safe by a competent person.

The protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied to or transmitted to the system. Every employee in an excavation shall be protected from cave-ins by an adequate protective system.

Sloping and Benching Systems

There are four options for sloping:

1. Slope to the angle required by the Standard for Type C, which is the most unstable soil type.
2. If the soil type is A or B, or if the excavation is in bedrock, the Appendix B of the OSHA Excavation Standard provides guidance on determining the maximum allowable angle;
3. Tabulated slope data prepared by a registered professional engineer; and
4. A registered professional engineer can design a sloping plan for a specific job.

Sloping and benching systems for excavations five (5) to twenty (20) feet in depth must be constructed under the instruction of a designated competent person.

Sloping and benching systems for excavations greater than twenty (20) feet must be designed and stamped by a registered professional engineer.

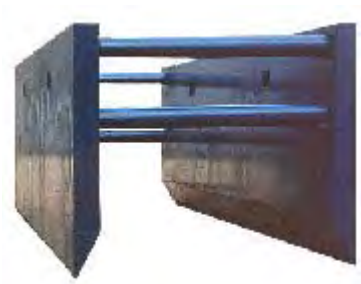
Refer to the most recent version of the OSHA Excavation Standard for additional guidance.

Shoring Systems

Shoring is another protective system or support system. Shoring utilizes a framework of vertical members (uprights), horizontal members (whales), and cross braces to support the sides of the excavation to prevent a cave-in. Metal hydraulic, mechanical or timber shorings are common examples.

The different examples of shoring are found in the most recent version of the OSHA Excavation Standard (Appendices E-G).

Shield Systems (Trench Boxes)



Shielding is the third method of providing safe excavation workplaces. Unlike sloping and shoring, shielding does not prevent a cave-in. Shields are designed to withstand the soil forces caused by a cave-in and protect the employees inside the structure. Most shields consist of two flat, parallel metal walls that

are held apart by metal cross braces.

Shielding design and construction is not covered in the OSHA Standards. Shields must be certified in design by a registered professional engineer and must have either a registration plate on the shield or registration papers from the manufacturer on file at the jobsite office. **THE MANUFACTURER MUST APPROVE ANY REPAIRS OR MODIFICATIONS.**

Safety precautions for shield systems include:

- Shields must not have any lateral movement when installed.
- Employees will be protected from cave-ins when entering and exiting the shield (examples - ladder within the shield or a properly sloped ramp at the end).
- Employees are not allowed in the shield during installation, removal, or during any vertical movement.
- Shields can be two ft. above the bottom of an excavation if they are designed to resist loads at the full depth and if there are no indications of caving under or behind the shield.
- The shield must extend at least 18 inches above the point where proper sloping begins (the height of the shield must be greater than the depth of the excavation).
- The open end of the shield must be protected from the exposed excavation wall. The wall must be sloped, shored or shielded. Engineer designed end plates can be mounted on the ends of the shield to prevent cave-ins.

SLIPS, TRIPS, AND FALLS

Falls are the leading cause of fatalities in the construction industry. An average of 362 fatal falls occurred each year from 1995 to 1999, with the trend on the increase.

It is important that Apex protects workers from falls on the job. The following hazards cause the most fall-related injuries:

- Unprotected sides, wall openings, and floor holes;
- Improper scaffold construction;
- Unguarded protruding steel rebars; and
- Misuse of portable ladders.

The control and prevention of slips, trips, and falls will be based on periodic inspections of the work areas in order to identify potential trip or slip hazards. Loose objects and/or spills will be cleaned up and other tripping hazards such as extension cords, tools, and trash, will be removed or secured. Using any unstable structures as work platforms is prohibited. Working in areas where elevated surfaces are six feet or higher (such as scaffolds and work platforms), where wall openings or floor holes are not protected by appropriate means (such as coverings, railings, chaining or roping off) will require the application of such protection. If this is not feasible, then use appropriate fall protection devices including safety belts, harnesses, lanyards,

and/or lifelines. Affected workers will be trained in the proper use of such fall protection devices.

References

- OSHA 29 CFR Subpart D, Walking and working surfaces.

OVERHEAD (FALLING OBJECT) HAZARDS

Hard hats minimize the potential for head injury from overhead (banging, bumping, falling object) hazards. Examples of such hazards include:

- Working on scaffolding; loose items that have been placed aloft that can fall and strike employees working below;
- Working inside low-ceiling, restrictive access containment areas;
- Work involving material handling; and
- Working near suspended loads.

Employees must use a hard hat when performing construction-type work activities such as: erecting containment and scaffolds; working inside containment areas; using material handling equipment (i.e., hoisting and rigging, cranes, heavy equipment, or powered industrial trucks); dismantling containments; and walking or working beneath low hanging structures such as piping or conduit. As in the case with slip, trip and fall hazards, each work area will be inspected to identify and remove or neutralize potential overhead hazards.

References

- OSHA 29 CFR 1926.759, Falling Object Protection
- OSHA Steel Erection eTool: http://www.osha.gov/SLTC/etools/steelerection/overhead.html

WELDING/HOT WORK

Apex personnel involved in welding and hot work processes are exposed to a variety of hazards including burns, fire, eye damage, possible lung irritation and damage, electric shock, slips and falls. The objective of this program is to prevent or eliminate the possibility of injuries and property damage that can occur from the hazards associated with welding and hot work operations.

Roles and Responsibilities

The provisions of this program are applicable to all Apex personnel. This program applies to all personnel (consultants, agency, contractors, and subcontractors - full and part-time) who work with or whose job responsibilities require them to be familiar with welding/hot work hazards, whether they work at Apex or on an Apex job site.

Apex management will review and evaluate this program regularly or when operational changes at a job site occur that require revision. This written program will be communicated to all personnel that are affected by it. Project managers are responsible for implementation of safe welding/hot work practices and procedures at the job site. Management shall recognize its responsibility for the safe usage of cutting and welding equipment on its property, and will designate cutting and welding areas.

All Apex personnel are responsible for halting operations when conditions require a Hot Work Permit and adhering to all requirements of the Permit once implemented.

Both the Hot Worker and the employee assigned to Fire Watch are responsible for the inspection of all welding and cutting operations and ensuring that all precautions that are to be taken shall be documented in a written hot work permit.

Those assigned to Fire Watch are responsible for maintaining watch over any cutting and welding to which they are assigned for the sole purpose of maintaining a safe work zone and shall have no other duties.

Hot Work Permitting

Should welding be required on-site, the project manager or qualified person must complete a **Hot Work Permit** (see Appendices) before welding will begin.

Engineering Controls

The following engineering controls are in place to prevent or minimize the possibility of injuries in the course of welding, cutting, brazing or hot work operations.

General

Employees shall place welding cables and other equipment so that it is clear of passageways, ladders, and stairways.

Eye protection

Helmets or hand shields shall be used during all arc welding or arc cutting operations, excluding submerged arc welding. Helpers or attendants shall be provided with proper eye protection.

Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations. Spectacles without side shields with suitable filter lenses are not permitted for use during gas welding operations on light work for torch brazing or for inspection.

Specifications for Helmets and Hand Shields

Helmets and hand shields shall be made of a material which is an insulator for heat and electricity. Helmets, shields and goggles shall be not readily flammable and shall be capable of withstanding sterilization.

Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc. Helmets shall be provided with filter plates and cover plates

designed for easy removal. All parts shall be constructed of a material which will not readily corrode or discolor the skin.

Goggles shall be ventilated to prevent fogging of the lenses as much as practicable.

Lenses shall bear some permanent distinctive marking by which the source and shade may be readily identified. The shade number must match the type of welding/hot work to be conducted.

PPE

General requirements - Supervisors will ensure that employees exposed to the hazards created by welding, cutting, brazing or hot work operations be protected by personal protective equipment in accordance with the requirements of 29 CFR 1910.132.

Appropriate protective clothing required for any welding operation will vary with the size, nature and location of the work to be performed.

Fire Prevention/Protection

Fire and explosion pose a serious risk to our employees during welding, cutting, brazing and hot work operations. Sparks can travel as much as 35 feet, and spatter can bounce on the floor or fall through openings creating hazards in other work areas of Apex job sites.

When possible, carry out all welding or cutting in special fire-safe areas or rooms with concrete or metal plate floors. Gas welding sets, if used, will be equipped with a compatible fire extinguisher and reverse air flow valves (check valves or flame arrestors). Any gas welding or cutting will comply with the requirements of the latest version of EM 385-1-1.

NOTE: welding/hot work in confined spaces introduce additional precautions and concerns which are beyond the scope of this Program.

Basic Safety Precautions

The basic safety precautions listed below will be followed by Apex employees performing welding, cutting, brazing and hot work operations. The basic precautions for fire prevention in welding or cutting work are:

- If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity shall be taken to a safe place;
- If the object to be welded or cut cannot be moved, and if all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag and to protect the immovable fire hazards;
- Wherever there are floor openings or cracks in the flooring, cracks or holes in walls, open doorways and open or broken windows precautions will be taken so that no readily combustible materials on the floor below will be exposed to sparks that might drop through the floor.

- Ducts and conveyor systems that might carry sparks to distant combustibles shall be suitably protected or shut down;
- Suitable fire extinguishing equipment shall be maintained in a state of readiness for instant use. Such equipment may consist of dry chemical, portable extinguishers;
- **Fire Watchers** shall be required whenever welding or cutting is performed at Apex job sites. Fire watchers will have fire extinguishing equipment readily available and be trained in its use and be familiar with facilities for sounding an alarm in case of a fire. They will watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm. A fire watch will be maintained for at least a 30 minutes after completion of welding or cutting operations to detect and extinguish possible smoldering fires;
- Before cutting or welding is permitted, the area shall be inspected by the project manager or qualified person responsible for authorizing cutting and welding operations. They shall designate precautions in the form of the **Hot Work Permit** and approve work before it starts;
- Where combustible materials such as paper clippings, wood shavings or textile fibers are on the floor, the floor shall be swept clean for a radius of 35 feet. Combustible floors shall be kept wet, covered with damp sand, or protected by fire-resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock; and
- Containers in or on which cutting/welding will take place must be purged of flammable vapors.

Prohibited Areas

Cutting or welding shall not be permitted in the following situations:

- In areas not authorized by management;
- In sprinkler-equipped buildings while such protection is impaired;
- In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts; and
- In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton.

Training

Apex management will determine whether training required for specific jobs will be conducted in a classroom or on-the-job. The degree of training provided shall be determined by the complexity of the welding/hot work requirements of the individual job and the associated hazards.

Prior to job assignment, Apex shall provide training to ensure that the hazards associated with welding/hot work operations are understood by employees, and that the knowledge and skills required for the safe application and usage of work place equipment are acquired by employees.

Refresher training for affected personnel will be conducted on an annual basis, if needed.

Recordkeeping

The welding/hot work training record requirements are:

- All training for employees on the Welding/Hot Work Program must be documented;
- All certification of training must be documented;
- An EHS specialist is responsible for all aspects of document maintenance and record retention; and
- All documentation shall contain the name of the employee and the date of completion and shall be retained for a period of one year.

Hot Work Permits shall be retained by the project manager or a qualified person for time period of a minium of one year.

References

- OSHA 29 CFR 1910.132, Personal Protective Equipment, General Requirements
- OSHA 29 CFR 1910 Subpart Q, Welding Cutting and Brazing
- National Fire Protection Association - Standard 51B, 1962
- American Welding Society Standard A6-1-1966
- OSHA Welding Cutting and Brazing Safety and Health Topics: http://www.osha.gov/SLTC/weldingcuttingbrazing/index.html

DRILL RIGS

This section focuses on the physical hazards at a typical drilling site. Apex personnel routinely conduct activities around drilling equipment, such as but not limited to:

- Geological support;
- Lithologic logging;
- Soil sample collection for geotechnical and/or hazardous material testing;
- Well installation for groundwater monitoring/sampling, injection or extraction; and
- Oversight of other contractors conducting drilling activities

Drilling equipment is hazardous and the sites where drill rigs are used are often hazardous. For this reason, it is important for Apex employees to have a good understanding of the safety hazards associated with drilling equipment and drilling sites.

At a typical drilling site, many activities occur simultaneously: for example, drilling, soil logging, air monitoring, sample packaging, and drumming of cuttings. A minimum of three personnel are generally present at a drilling site (the driller, the helper, and a Apex field employee), but field crews consisting of six or more persons are not uncommon. Several types of heavy field equipment may be used at a drilling site, such as: drill rig or direct-push rig; concrete corer; service trucks; water trucks; large air compressors; generators; mud pumps and mud pans (for circulating drilling fluid and settling cuttings during mud rotary drilling); and "cyclones" (for collecting cuttings during air rotary drilling).

The types of drilling equipment that may be encountered include, but are not limited to the following:

- hollow-stem and solid-auger drilling;
- limited-access rig drilling;
- mud rotary drilling;
- air rotary drilling;
- cone penetrometer testing (CPT);
- direct push soil/gas/soil groundwater sampling

The combination of many simultaneous activities, numerous subcontractors and other personnel on site, and heavy field equipment can render a drilling site hazardous to the physical safety of site workers. It is imperative, therefore, that Apex field personnel understand the potential hazards of a drilling site before they arrive at the site.

Topics that are designed to promote safe drilling are described below and include:

- Conducting an initial cursory safety inspection of the drilling site;
- Conducting a Health and Safety Tailgate Meeting;
- Communicating potential safety hazards to other Apex personnel and to subcontractors;
- Maintaining a safe work environment throughout typical drilling activities; and
- Responding to emergencies on site

Initial Safety Inspection

The project EHS specialist is in charge of the health and safety of personnel working on site.

Before Drilling Activities:

- Look up; be aware of overhead utilities and hazards.
- Look down; was an underground utility markout performed? Is so, be aware of tolerance zones. If not, do not do any intrusive work until a utility markout is performed.
- Look all around and inspect drill rig- drillers responsibility to provide safe, functioning equipment.
- Note the fall radius of the drill rig tower in any direction.
- Check the weather. Beware of lightening and inclimate weather and be prepared to stop work, if necessary.
- Inspect subcontractor personnel PPE along with Apex personnel PPE. Make sure designated PPE is being utilized.

During Drilling Activities:

Observe work area, avoid slip, trip, fall situations. Allow adequate pathways for personnel to move and conduct their work.

Before beginning each day's work at the site, conduct an initial safety inspection of the site.

"Look Up": Observe the overhead power line clearance around the drill rig. Verify that the rig is at least the required horizontal distance from any active power line as specified in OSHA 29 CFR 1926.550. If this is not the case, contact the project manager and either relocate the drilling location or wait until the line is deactivated. If drilling must be conducted at a horizontal distance closer than an average of 20 feet from an active power line, the local electric company must be notified, and must deactivate ("kill") the line while work is being conducted at the site. Note the fall radius of the drill rig tower. The typical rig tower could conceivably fall in any direction, to a distance at least its own length (plus the height of the rig if it falls sideways or backward with the rig). Place field personnel outside this fall radius, and orient field vehicles either outside the fall radius or facing a direction that allows quick escape from the work site, should the rig give indication that the tower may fall.

Check the weather. Beware of lightning and be prepared to stop work (this is an absolute MUST to avoid a lightning strike of the rig tower and electrocution of field personnel!)

Inspect the subcontractor and Apex personnel for proper PPE use. At a minimum, all personnel are required to wear Level D gear, which includes hard hats, safety glasses or goggles, ear plugs, long-sleeved shirts and long pants, work gloves and steel toe boots. Stop work until all personnel are wearing the appropriate PPE.

Observe the work area. Do not allow tools or equipment to be scattered throughout the area, as this could lead to slip/trip/fall accidents. Make sure that equipment is placed away from heavy

work areas, such as the path of the driller's helper (who often carries drill pipe, augers, and heavy sacks of supplies back and forth).

"Look Down": All drilling work must be cleared in advance with the local branch of the national underground line alert service. The service is generally free, but must be activated several days prior to fieldwork, and must be accompanied by paint or other field markings of drilling locations. The relevant agencies, utility companies, oil companies, cable companies, and other parties are notified by the service, and will demarcate their lines on the site if they run through the site. Scan the work site for indications of underground pipelines or utility lines (for example: breaker boxes, fire hydrants in a line, aboveground pumps). Look for paint markings from the notified agencies/companies/other parties demarcating their lines, and determine whether any lines are within 5 feet of proposed drilling locations. If any lines are too close, contact the project manager and relocate the drilling locations appropriately.

Daily Safety Tailgate Meeting

A daily safety tailgate meeting is also required prior to the beginning of each day's field work. This is critical, because personnel may need to be reminded of existing hazards on site, and because personnel and site hazards may change through the course of field work.

Gather all field personnel together. Begin the meeting by introducing yourself as the On-Site Safety Officer in charge of the overall health and safety of the field crew and will be working in tandem with the leader of the subcontractor's crew. Briefly explaining the site history and purpose of the field work, if not confidential. Discuss the potential chemical and physical hazards on site, and the steps to mitigate those hazards during field work (e.g., PPE, air monitoring, , field communication). Show the field personnel a map with the route from the work site to the nearest hospital; keep the map in a readily accessible location (e.g., your field vehicle). Note the locations of the nearest telephone and the relevant emergency phone numbers. Find out which field personnel have First Aid/ CPR training. Discuss a general emergency response plan for personnel medical emergencies and for any other possible emergencies unique to the project. Have all field personnel sign the **Daily Tailgate Safety Meeting Form** (see Appendices).

Communicating Potential Safety Hazards

The daily health and safety tailgate meeting not only informs the field crew of the health and safety concerns on site, but also establishes the tone of the field effort, a level of trust among the field crew, and a straightforward line of communication throughout the field effort.

Apex field personnel should report any health and safety concerns to you immediately. Ideally, the subcontractor's crew should do the same, but in many cases, their personnel report to their leader instead. It is important to establish that, whichever path the communication takes within the subcontractor's field crew, that any health and safety concerns are reported to you promptly, so that the site is kept under control and appropriate remedial actions are taken.

During the daily health and safety tailgate meeting, you have established that you are ultimately responsible for the health and safety of all field personnel on site. Furthermore, all field personnel have signed the health and safety tailgate meeting attendance form and have agreed to follow site health and safety procedures. Therefore, do not be afraid or embarrassed to remind (or even reprimand) Apex or subcontractor personnel if they are not following proper health and safety procedures. You have the right to stop work if they do not comply with these procedures. Be sure to report any work stoppages to your Project Manager.

Maintaining a Safe Working Environment

It is easy to overlook health and safety monitoring during field work when you are faced with a multitude of simultaneous duties. Try not to focus on your scope of work only, and do not rush if there is any chance of creating a hazard.

Maintain an awareness of your surroundings during field work. Stop and look around every few minutes. Make sure all personnel are accounted for.

Following are some common situations, which occur during field work and should be avoided or mitigated immediately:

- Moving drill rig closer to active overhead power lines or marked or suspected underground lines;
- Moving drill rig to severely sloping/uneven/unstable ground;.
- Field personnel eating in the work area;
- Field personnel removing required PPE;
- Field personnel showing signs of heat or cold stress or chemical exposure; and
- Apex personnel approaching borehole too closely during drilling. There have been cases where field geologists and engineers have been caught in the augers or the drill stem and have been killed. Also, during air rotary drilling small bits of rock can explode from the borehole as it is being "cleaned out" (i.e., drill bit worked up and down the borehole) and can injure nearby personnel.

Responding to Emergencies

Even with the most careful planning and health and safety monitoring, emergencies do occur during field work. An emergency response plan should be a part of the health and safety tailgate meeting, and should be implemented by you promptly should an emergency arise.

When an emergency occurs, do not panic! Remember, you are the leader in charge of health and safety. Responding quickly but calmly will greatly improve the effectiveness of your remedial efforts.

The first rule of thumb: survey the scene. Determine what the most immediate life-threatening dangers are, and remove personnel from them as quickly as possible. If the dangers can be deactivated safely, do so.

Rule number two: Identify any victims-injured field personnel. Use proper first aid procedures for notifying emergency response personnel (call 911), checking the victims' condition, and taking steps to mitigate injury or maintain life support (e.g., CPR/rescue breathing).

Rule number three: Remember the scene even as it is occurring. Review it at a later date, when it is safe to do so. Determine what mistakes, if any, were made during field work which may have caused the emergency, and learn from them. Unfortunately, time and experience in dealing with field emergencies is often the best teacher.

References

- OSHA 29 CFR 1926.550, Cranes and Derricks
- OSHA 29 CFR 1926.651(b)(1-4), Specific Excavation Requirements
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)
- Contractors Association (NDCA). Drilling Safety Guide. National Drilling Federation. C. Driscoll, Fletcher.
- ATEC Associates, Inc. Drilling Safety: Working in the Danger Zone. ATEC, 1991.

UNDERGROUND UTILITIES

The importance of safe excavation practices cannot be overstated. In addition to the safety hazards encountered when excavating around buried utilities, there are serious potential service outages that could occur if a utility is damaged or severed. There are hundreds of thousands of miles of underground utilities. Many of these are potentially dangerous or even deadly to the excavator that might hit them accidentally when excavating. This includes danger to professional excavators, homeowners, and others.

One-Call Facility Locate Request (Utility Markout)

Apex Personnel should request the location of underground utilities at each site by notifying the utility owner/operator through the one-call system at least two working days and no more than ten working days prior to beginning excavation.

Provide all the necessary information:

- Nearest intersection and/or closest street
- Type of work being performed (i.e. drilling, trenching)
- Extent of excavation
- Date work is scheduled

The more information available about the site and the job to be performed the better.

Additional resources for obtaining site specific information:

- Request onsite meeting with the property owner;
- Request as-built schematics;
- Request plans for repairs, upgrades or modifications; and
- Retain independent utility contractor.

Pre-marking allows the excavators to accurately communicate to utility owners/operators or their locator where excavation is to occur.

When the excavation site can not be clearly and adequately identified on the locate ticket, Apex Personnel should designate the route and/or area to be excavated using white pre-marking prior to the arrival of the locator. The route of the excavation should be marked with white paint, flags, stakes, or a combination of these to outline the dig site prior to notifying the one-call and before the locator arrives on the job.

GREEN Sewer and Drain Lines	BLUE Potable Water	RED Electric Power Lines, Cables, Conduit, and Lighting Cables	WHITE Proposed Excavation
PURPLE Reclaimed Water, Irrigation, and Slurry Lines	YELLOW Gas, Oil, Steam, Petroleum, or Gaseous Materials	ORANGE Communication, Alarm or Signal Lines, Cables, or Conduit	PINK Temporary Survey Markings

When the request to the one-call center is made, he/she is told which utility owners/operators will be notified. Apex personnel should log these on his/her job sheet so that he/she can identify which utility owners/operators have responded by marking and which ones have cleared the area. On the flip side, when a utility owner/operator does not respond by marking or clearing, this could signal that the utility owner/operator did not receive a locate notice.

Locate Reference Number

Apex Personnel should receive and maintain a reference number from the one-call center that verifies the location requested. The number is proof of notification to the members. The computer generated request identifies the date, time, and sequence number of the locate request. Each locate request ticket (notification) is assigned a unique number with that one-call center, the requestor and the utility owner/operator. This number separates this ticket from all other tickets so that it can be archived and recalled upon request with the details of that request only.

Separate Locate Requests

Every contractor on the job should have a separate one-call reference number before excavating. Often, there are several excavators on a job site performing work. The construction schedule may dictate different types of work requiring excavation from different specialty contractors simultaneously. In these situations it is imperative for each excavator to obtain a one-call reference number before excavation to ensure that the specific areas have been appropriately marked by any affected underground utility owner/operator.

Facility Relocations

Apex Personnel should coordinate work that requires temporary or permanent interruption of a utility owner/operator's service with the affected utility owner/operator in all cases. One-call centers note special contractor requests for a joint meeting on the ticket to the utility owner/operator to initiate the process.

Pre-Excavation Meeting

When practical, Apex employees should request a meeting with the utility locator at the job site prior to the actual marking of utility locations. The meeting will facilitate communications, coordinate the marking with actual excavation, and assure identification of high priority facilities. An on-site pre-excavation meeting between Apex personnel, the utility owners/operators and locators (where applicable) is recommended on major or large projects. This includes projects such as road, sewer, water, or other projects that cover a large area, progress from one area to the next, or that are located near critical or high priority utilities.

Such utilities include, but are not limited to;

- High-pressure gas, high voltage electric,
- Fiber optic communication, and
- Major pipe or water lines.

Utility Owner/Operator Response

The utility owner/operator is required to mark its underground facilities with stakes, paint or flags or notify the excavator that the facility owner/operator has no underground facilities in the area of excavation.

Positive Response

Apex should be notified by the utility owner/operator of the tolerance zone of the underground utility by marking, flagging, or other acceptable methods at the work site, or is notified that a no conflict situation exists. If a utility owner/operator determines that the excavation or demolition is not near any of its existing underground utilities, it notifies the excavator that no conflict exists and that the excavation or demolition area is "clear."

This notification may be provided by:

- Face-to-face communications;
- Phone or phone message
- Facsimile or other electronic means;
- Posting at the excavation of demolition area;
- Marking the excavation or demolition area

If an excavator has knowledge of the existence of an underground facility and has received an "all clear," Apex personnel must attempt to communicate that a conflict does indeed exist and the locator should make marking these utilities a priority before excavation begins.

Failure to Respond

If the utility owner/operator fails to respond or if the utility owner/operator communicates that the underground utility cannot be marked within the time frame and a mutually agreeable date for marking cannot be arrived at, Apex personnel should re-call the one-call center.

The utility owner/operator and the excavator should partner together to ensure facilities are marked in an acceptable time frame to allow for underground utility protection. Prior to excavation, excavators verify they are at the correct location and verify locate markings and, to the best of their ability, check for unmarked utilities.

Excavation/Construction

Upon arrival at the excavation site prior to beginning the excavation, the Apex personnel should:

- **Verify** that the dig site matches the one-call request, that all utilities have been marked, reviewing color codes if in doubt, and all service feeds from buildings and homes.
- **Check** for any visible signs of underground utilities, such as pedestals, risers, meters, and new trench lines and for any utilities that are not members of the one-call.
- **Review** the location of underground utilities with site personnel.

Marking Preservation

Apex personnel should protect and preserve the staking, marking, or other designations for underground utilities until no longer required for proper and safe excavation. They should stop excavating and notify the one-call center for re-marks if any facility mark is removed or no longer visible.

During long complex projects, the marks for underground facilities may need to be in place far longer than the locating method is durable. Paint, staking and other marking techniques last only as long as the weather and other variables allow. When a mark is no longer visible, but work continues around the utility, request a re-mark to ensure the protection of the utility.

Excavation Observer

Apex personnel should have an observer to assist the equipment operator when operating excavation equipment around known underground utilities. The observer is a worker who is

watching the excavation activity to warn the equipment operator while excavating around a utility to prevent damaging that buried utility.

Excavation Tolerance Zone

Apex personnel will observe a tolerance zone which is comprised of the width of the utility plus 18" on either side of the outside edge of the underground utility on a horizontal plane.

Excavation within Tolerance Zone

When excavation is to take place within the specified tolerance zone, Apex personnel will exercise such reasonable care as may be necessary for the protection of any underground utility in or near the excavation area.

Mis-Marked Facilities

Apex personnel should notify the utility owner/operator directly or through the one-call system if an underground utility is not found where one has been marked or if an unmarked underground utility is found.

If an unmarked or inaccurately marked utility is found, excavation should stop in the vicinity of the facility and perform notification. If excavation continues, plan the excavation to avoid damage and interference with other utilities and protect utilities from damage.

Methods to consider, based on certain climate or geographical conditions, include:

- Hand digging when practical (pot holing),
- Soft digging,
- Vacuum excavation methods,
- Pneumatic hand tools, and
- Other mechanical methods with the approval of the utility owner/operator, or other technical methods that may be developed.

Exposed Utility Protection

Apex personnel should support and protect exposed underground utilities from damage. Protection of exposed underground utilities is as important as preventing damage to the utility when digging around it. Protecting exposed underground utilities helps to insure that the utility is not damaged and at the same time protect employees working in the vicinity of the exposed utility.

Exposed utilities can shift, separate, or be damaged when they are no longer supported or protected by the soil around them. Apex personnel should support or brace exposed utilities and protect them from moving or shifting which could result in damage. This can be accomplished in different ways, for example, by shoring the facility from below or by providing a timber support with hangers across the top of an excavation to insure that the utility does not

move or bend. In addition, workers should be instructed not to climb on, strike, or attempt to move exposed utilities which could damage protective coatings, bend conduit, separate pipe joints, damage cable insulation, damage fiber optics, or in some way affect the integrity of the utility.

Locate Request Updates

Apex personnel should call the one-call center to refresh the ticket when excavation continues past the life of the ticket (sometimes, but not always, defined by state law). If not currently defined in state law, ticket life would best be 10 working days but not to exceed 20 working days.

Many utility owners/operators do not perform their own locates and utilize the services of a contracted facility locator. These contracted facility locators may not be aware of work planned in the near future. By excavators refreshing the locate ticket, the contract locator has another opportunity to identify newly placed utilities. This practice also gives the utility owner/operator another chance to identify the location of their utilities and to avoid a possible damage and disruption of service should something have been marked incorrectly or missed on a previous locate.

Facility Damage Notification

Apex personnel discovering or causing damage to underground utilities should notify the utility owner/operator and the one-call center. All breaks, leaks, nicks, dents, gouges, groves, or other damages to utility lines, conduits, coatings or cathodic protection should be reported.

The possibility of utility failure or endangerment of the surrounding population dramatically increases when a facility has been damaged. While the utility may not immediately fail, the underground utility owner/operator should have the opportunity to inspect the damage and make appropriate repairs.

Notification of Emergency Personnel

If the protective covering of an electrical line is penetrated or gases or liquids are escaping from a broken line which endangers life, health or property, Apex personnel should immediately contact local emergency personnel or call "911" to report the damage location. This practice minimizes the danger to life, health or property by notifying the proper authorities to handle the emergency situation. In these situations, local authorities are able to evacuate as appropriate and command substantial resources unavailable to Apex or underground utility owner/operator.

Emergency Excavation

When an emergency excavation, maintenance, or repair is required, initiation may be immediately performed, provided that the excavator notifies the one-call center and utility owner/operator as soon as reasonably possible. This includes situations that involve danger to

life, health, or property, or that require immediate correction in order to continue the operation of or to assure the continuity of public utility service or public transportation.

Backfilling

Apex should protect all utilities from damage when backfilling an excavation. Trash, debris, abandoned lines, coiled wire, or other material that could damage existing utilities or interfere with the accuracy of future locates should not be buried in the excavation. Extra caution must be taken to remove large rocks, sharp objects, and large chunks of hard packed clay or dirt.

As-Built Documentation

In order for a utility owner/operator to maintain accurate records of the location of their facilities, it is critical that Apex notify the utility owner/operator of deviations to the planned installation. When this occurs, it becomes much more critical to notify the utility owner/operator of changes. For example, it is common to make adjustments in the location of the new utilities when rocks or other underground obstructions are encountered or the location of the new utility conflicts with another existing underground facility. This change in plan can be both changes in horizontal or vertical distances from the specified plans. The utility owner/operator should have established standards that require notification if a deviation is beyond specified tolerances, such as changes in depth of 6 inches or more and lateral measurement changes of greater than 1 foot. Once these changes to the expected location are communicated to the utility owner/operator, it is their responsibility to take appropriate action to update their records so that an accurate locate can be conducted in the future.

References

- OSHA 29 CFR 1926.651 (b)(4) – Specific Excavation Requirements
- OSHA 29 CFR 1910.269 – Electric Power Generation, Transmission, and Distribution
- U.S. Department of Labor Website: www.dol.gov
- American Public Works Association: www.apwa.net
- National Institute for Occupational Safety and Health - NIOSH: www.cdc.gov/niosh
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)

SCAFFOLDING

This section is designed to provide a minimal level of information to Apex employees about scaffolding work in general. Additional information should be sought, as necessary, by personnel responsible for projects using scaffolding.

The section does not apply to crane or derrick suspended scaffolds, or aerial lifts.

Types of Scaffolding

A scaffold is an elevated working platform for supporting both personnel and materials. It is a temporary structure, used mainly in construction and/or maintenance work. Falls from elevated scaffolds are the leading cause of death and serious injury resulting from scaffold use.

There are three basic types of scaffolding:

- **Supported scaffolds** – platforms supported by rigid, load bearing members, such as poles, legs, frames and outriggers;
- **Suspended scaffolds** – platforms suspended by ropes or other non-rigid overhead support; and
- **Aerial Lifts** – such as "cherry pickers" or "boom trucks"

Hazards

Employees working on scaffolds are exposed to potential hazards including:

- Falls from elevation – caused by slipping, unsafe access, and the lack of fall protection;
- Struck by falling tools/debris;
- Electrocution – from overhead power lines; and
- Scaffold collapse- caused by instability or overloading.

Employees are not to stand on overhanging sections of platforms unless:

- The platform is protected from cantilevering; and
- The employee is protected from falling.
- Employees will not work on scaffolds:
- During electrical storms or high winds; and
- That are covered with ice and snow, unless all ice and snow is removed and the planking is prepared in such a way to prevent slipping.

Hotwork

No welding, burning, riveting, or open flame work will be performed on any scaffolding suspended by means of fiber or synthetic rope.

Horizontal Movement

Scaffolds must not be moved horizontally while employees are on them.

Slip, Trips and Falls

- Slippery conditions on scaffold will be eliminated as soon as possible after they occur;
- Tools, materials, and debris will not be allowed to accumulate on platforms so as to cause a hazard; and
- Upon completion of scaffold, all trash, debris or materials on the ground that could cause a trip hazard will be cleaned up.

Personnel Safety

Employees must be protected from falls by the use of guardrails or other effective means (safety nets or personal fall arrest systems (PFAS)) while standing or working in place on scaffolds 10 feet or greater in height.

Personnel are not to tie-off lanyards for personal fall arrest systems to scaffold members that will not support the impact load of the fall (check with the competent person for acceptable tie-off points).

Falls from elevation may occur while climbing on or off the scaffold, while working on unguarded scaffold platforms and when scaffold platform or planks fail.

Scaffold Access

Access must be provided when scaffold platforms are more than 2 feet above or below a point of access.

Permitted types of access:

- Ladders, such as portable, hook-on attachable, stairway type, and built-ins;
- Stair towers;
- Ramps and walkways;
- Use of building stairs;
- From another scaffold, structure of hoist ; and
- Some end frames.

Access is **not** permitted by:

- Crossbraces; and
- Ladders with bottom rung more than 24 inches high.

Scaffold Design and Construction

Essential elements of safe scaffold construction include using appropriate construction methods, proper scaffold access, and proper use by a competent person. Additional construction specifications are listed below:

- Be fully planked or decked with no more than 1 inch gaps;
- Be able to support its weight & 4 times maximum load;
- Be at least 18 inches wide;
- No large gaps in front edge of platforms;
- Each abutted end of plank must rest on a separate support surface;
- Overlap platforms at least 12 inches over supports, unless restrained to prevent movement;

- No paint on wood platforms;
- Use scaffold grade wood;
- Fully planked between front upright and guardrail support;
- Component pieces used must match and be of the same type;
- Erect on stable and level ground;
- Lock wheels and braces;
- The height of the scaffold should not be more than four times its minimum base dimension unless guys, ties, or braces are used;
- Each end of a platform, unless cleated or otherwise restrained by hooks, must extend over its support by at least six inches;
- Platforms should be supported by legs, outrigger beams, brackets, poles, uprights, posts, & frames; and
- Scaffold poles and uprights must be on base plates and mud sills or other firm foundation.

Inspections

Scaffolds are to be inspected initially, before each work shift, and after an incident which may have affected the integrity of the scaffold. The inspection shall be documented.

Training Working on Scaffolding

Each scaffold type has unique hazards and safety requirements, therefore, it is necessary and required by the OSHA for employees to be trained on each type of scaffold they are assigned to use. OSHA requires employers to appoint a person who is "competent" to supervise scaffold activities. Where Apex employees are assigned to use scaffolds, it shall be the competent person's responsibility to ensure that employees have received the necessary training for each type of scaffold he/she will supervise, before allowing employees to begin work.

Personnel are not to climb on, construct or modify scaffolds until they have received training in the recognition and control of scaffolds hazards. Supervisors are to consult with an Apex EHS specialist for the type of training that will be required before allowing employees to work with, around or on scaffolds.

Training Requirements

The training must include:

- Nature of electrical, fall, and falling object hazards;
- How to deal with electrical hazards and fall protection systems;
- Proper use of the scaffold;
- Scaffold load capacities; and
- Retrain as necessary.

OSHA 29 CFR 1926.454(a)(1-5)

Erecting, Disassembling, Moving, Operating, Repairing, Maintaining, or Inspecting Scaffold

The employer shall have each employee who is involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold trained by a competent person to recognize any hazards associated with the work in question. The training shall include the following topics, as applicable:

Training Requirements

The training must include:

- Nature of scaffold hazards;
- The correct procedure for erecting, disassembling, moving, operating, repairing, inspecting and maintaining the type of scaffold in questions;
- The design criteria, maximum intended load-carrying capacity and intended use of the scaffold; and
- Retrain as necessary.

OSHA 29 CFR 1926.454(b)(1-4)

Re-Training

Workers will be retrained when the competent person or supervisor has reason to believe that a worker lacks the skill or understanding needed for safe work involving the use of scaffolds.

In addition to these, re-training will occur where:

- Changes at the worksite present a hazard which the worker had not been previously trained for; and
- Where changes in the types of scaffolds and associated equipment presents a hazard which the worker had not been previously trained.

References

- OSHA 29 CFR 1910.28, Subpart D – Safety Requirements for Scaffolding
- OSHA 29 CFR 1926 Subpart L – Scaffolds
- OSHA 29 CFR 1926 Subpart M – Fall Protection
- OSHA 29 CFR 1926.100 – Head Protection
- OSHA 29 CFR 1926.104 – Safety Belts, lifelines, and lanyards
- OSHA 29 CFR 1926.105 – Safety nets
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)

PORTABLE LADDER SAFETY

Purpose

The Apex Companies, LLC (Apex) has developed this program to ensure the safety of employees working with ladders. This program is intended to comply with the Occupational Safety and Health Administration (OSHA) Standards contained in 29 CFR 1910.25-26.

Scope

This program applies to all Apex employees who may be expected to use a ladder during the course of work. This program covers the following ladders: step, extension, and other portable ladders. Users must be able to recognize and avoid ladder hazards and be aware of safe practices in setting up, storing, and working with ladders.

Policy

All ladders used at APEX are covered by this program.

Authority and Responsibility

Manager, Corporate Health and Safety is responsible for:

1. Ensuring that ladder safety measures are in place according to this program and the applicable OSHA standards;
2. Ensuring that workers are trained in ladder safety;
3. Maintaining training records; and
4. Periodically evaluating program implementation.

Supervisors are responsible for:

1. Ensuring that all ladders used at APEX are free from defects and all moving parts are working properly;
2. Ensuring that all affected employees using ladders have been trained;
3. Ensuring that all affected employees comply with this program;
4. Taking ladders out of service if they are defective; and
5. Conducting periodic inspections of work areas.

Employees are responsible for:

1. Complying with the requirements of this program;
2. Attending required training programs;
3. Inspecting ladders for defects or possible hazards prior to use;
4. Tagging any defective ladder as out of service; and
5. Reporting any ladder defects to their supervisor.

Types of Portable Ladders

Stepladder: Self-supporting portable ladder, non-adjustable in length, having flat steps and a hinged back.

Single Ladder: A non self-supporting portable ladder, nonadjustable in length, consisting of one section.

Extension Ladder: A non self-supporting portable ladder adjustable in length, consisting of multiple sections.

The American National Standards Institute (ANSI) requires that a duty rating sticker be placed on the side of the ladder. When selecting a ladder, be sure to use the proper duty rating to carry the combined weight of the user and material. The ladder duty ratings are as follows:

- *Type 1A (Extra Heavy Duty Industrial)*: 3-20 feet for heaving duty, such as utilities, contractors, and industrial use. Load capacity not to exceed 300 pounds.
- *Type I (Industrial)*: 3-20 feet for heavy duty, such as utilities, contractors, and industrial use. Load capacity not to exceed 250 pounds.
- *Type II (Commercial)*: 3-12 feet for medium duty, such as painters, offices, and light industrial use. Load capacity not to exceed 225 pounds.
- *Type III (Household)*: 3-6 feet for light duty, such as light household use. Load capacity not to exceed 200 pounds.

Selection of Ladders

Ladders are generally available in three material compositions: wood, fiberglass, and metal.

Wood Ladders

Wood Ladders are electrically non-conductive and are the best natural insulator against heat. They can be electrically conductive if wet. Wood ladders are heavier than metal. They are susceptible to drying and rotting and need a clear finish to protect them.

Fiberglass Ladders

Fiberglass ladders are strong, lightweight, and electrically non-conductive. They do not dry out and split like wood. They are slow to conduct heat, so they are able to withstand heat exposure without losing strength. They are heavier than wood or metal and are not available in longer extension ladders. Fiberglass may chip or crack under severe impact. When overloaded, fiberglass does not bend, it cracks and fails.

Metal Ladders

Metal ladders are very strong and lightweight. They dent, but do not chip or crack when subjected to severe impact. They do not require a protective varnish for protection. They do conduct heat rapidly. If they are exposed to heat, they will lose their tensile strength. They must

not be used when working on or near electrical wires or when working around energy sources. Metal ladders must be labeled with a DANGER warning sticker indicating electrocution hazard.

Ladder Care and Maintenance

Ladders shall be maintained in good condition at all times by ensuring the following:

1. The joint between the steps and side rails shall be tight;
2. All hardware and fittings shall be securely attached;
3. Movable parts shall operate freely without binding or excessive play;
4. Locks, wheels, pulleys, and other bearings shall be frequently lubricated;
5. Frayed or badly worn rope shall be replaced;
6. Safety feet and other auxiliary equipment shall be kept in good condition;
7. Ladders shall be inspected frequently;
8. Ladders with defects shall be taken out of service and tagged as "Dangerous, Do Not Use."
9. Ladder repairs must restore the ladder to its original design criteria before the ladder may be returned to use;
10. Rungs shall be kept free of grease and oil;
11. Metal steps and rungs shall be grooved or roughened to prevent slipping; and
12. Wood ladders shall not be painted with an opaque finish or coated with any material that may hide defects. Use only clear varnish.

Ladder Storage

When not in use, ladders shall be stored in a designated location out of direct sunlight and not exposed to harmful elements that may cause decay/damage. Never store materials on a ladder. Straight and extension ladders should be stored in storage racks. Be sure that ladders are secured when in transit. Vibration and bumping against other objects may cause damage.

Ladder Inspection

The user shall inspect the ladder prior to use. Ladders shall be inspected by a supervisor or designee for visible defects on a semi-annual basis and after any incident that could affect their safe use. Inspections should include all of the following:

1. Inspect for side rail dents or bends or excessively dented rungs;
2. Check all rung-to-side-rail connections;
3. Check hardware connections; and
4. Check rivets for shear.

Record the semi-annual inspection and retain the records locally.

Ladder Set-up

Prior to climbing a ladder, it shall be set up according to the following:

1. Position the ladder so that the side rails extend at least 3 feet above the landing;

2. Secure the side rails at the top to a rigid support and use a grab device when 3 foot extension is not possible;
3. Extension ladders shall be extended from the ground only;
4. Make sure the weight on the ladder will not cause it to slip off its support;
5. Portable ladders shall be used so that the base is a distance from the vertical wall equal to one-fourth the working length of the ladder;
6. The ladder base must be placed with secure footing;
7. The ladder shall be placed or held in place to prevent slipping;
8. Ladders shall not be used in a horizontal position as a platform, a runway, or scaffold;
9. Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked upon, locked, or guarded;
10. Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height;
11. No ladder shall be used to gain access to a roof unless the top of the ladder extends at least 3 feet above the point of support, at eave, gutter, or roofline;
12. The user shall equip all portable rung ladders with non-slip bases or secure the ladder when there is a hazard of slipping;
13. The area around the ladders must remain clear from debris, equipment, etc.;
14. The minimum overlap for the two-sections on extension ladders shall be:

Size of Ladder (feet)	Overlap (feet)
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

15. Never place a ladder near electrical wiring or against operational piping (chemical, gas, sprinkler systems) where damage may occur;
16. When two or more ladders are used to access a work area, they must offset with a landing or platform between the ladders; and
17. Always check for stability prior to climbing.

To set up a straight or extension ladder:

1. Lay the ladder on the ground with the base resting against the bottom of the wall and the top pointing away from the wall;
2. Starting at the top, lift the ladder over your head and walk under the ladder to the wall. Move hands from rung to rung as you go.

3. When the ladder is vertical and the top touches the wall, pull the base out so that the distance from the wall is one-fourth the height to the point of support; and
4. Reverse the process to remove the ladder.

Climbing and Standing

When climbing or standing on a ladder, the following safety precautions shall be followed:

1. Make sure shoes are free of mud, soil, or anything slippery;
2. When ascending or descending, the user must face the ladder;
3. Use at least one hand to grasp the ladder when climbing. Maintain at least three points of contact with the ladder (two feet and one hand or two hands and one foot);
4. The top rest for portable rung and cleat ladders shall be rigid and have strength to support the load;
5. The top two steps of a stepladder shall not be used for standing. The highest working height shall be clearly marked;
6. Do not stand on the pail shelf of a stepladder;
7. Do not straddle the front and back of a stepladder;
8. The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing;
9. Never stand on the top two rungs of a straight or extension ladder;
10. Supplies or equipment shall not be hand carried by the worker on the ladder; instead, a rope, block, or pulley system shall be used to move the equipment;
11. To help prevent loss of balance, carry small items such as hammers, nails, pliers, etc. in a tool belt;
12. When working to the side of a ladder, the centerline of the body must be maintained between the side rails;
13. Do not overreach or lean too far to one side;
14. No more than one person shall be on a ladder at a time unless the ladder is manufactured to support an additional person;
15. Do not move, shift, or extend ladders while in use;
16. Never climb onto a ladder from one side;
17. Never slide down a ladder;
18. Never sit on ladder rails; and
19. If you feel sick or dizzy while climbing or standing on a ladder, do not try to climb down in a hurry. Drape your arms around the rungs and rest your head against the ladder until you feel better. Then climb down slowly

Securing the Ladder

The following are required to secure ladders:

1. Single and extension ladders shall be secured at the top and bottom to prevent movement. To secure the ladder at the bottom, flip the ladder shoes so that the spurs poke the ground. If setting up a ladder on hard surfaces, tie ropes to both ladder legs beneath the lowest rung and tie the other end of the ropes to a solid anchored object at or near the base of the wall. If possible, nail a cleat behind the ladder's feet to prevent the ladder from slipping. To secure the ladder at the top, use roof hooks, tie it to a solid anchor, use rubber or soft plastic "mitts", or use a ladder stabilizer. If the ladder cannot be secured at both the top and bottom, it shall be secured at the base. If this still is not possible, an employee must stand at the base and secure it manually;
2. Step ladders shall be opened completely and ensure that the spreader is locked prior to use. Never use a stepladder in an unfolded position;
3. Never use ladders on slippery surfaces or on snow or ice unless secured or the ladder is equipped with non-slip or spike feet;
4. Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded.

Use On or Near Electrical Equipment

Safety-related work practices shall prevent electric shock or other injuries from electrical contact when work is performed on or near equipment or circuits that are or may be energized. These work practices shall be consistent with the nature and extent of the associated electrical hazards.

Metallic or metal-type ladders shall NOT be used around electrical energy, components, and sources. Portable ladders shall have nonconductive side rails if used where the employee or ladder could contact exposed energized parts. The requirements found in OSHA 29 CFR 1910.333 shall be followed. Additional training, such as lockout tagout and electrical safety training, is required for this application. Contact EHS for further training.

Training Requirements

All employees shall be trained prior to portable ladder use to recognize hazards and procedures to minimize hazards. Employees shall be trained in the following:

- The recognition of possible hazards associated with ladder use, maintenance, and safety precautions;
- The proper use and placement of ladders; and
- The maximum intended load capacities of ladders used.

Employees shall be retrained as necessary to maintain their understanding and knowledge on the safe use of ladders.

References

- 29 CFR 1910.25-26

- 29 CFR 1910.333
- 29 CFR 1926.1053

HAND AND POWER TOOLS SAFETY PROGRAM

Tools are such a common part of our lives that it is difficult to remember that they may pose a hazard while being used. Portable hand and power tools enable personnel to apply additional force and energy to accomplish a task. Our hands are always where the action is, so they are exposed to hazards that can mutilate or destroy them.

This program has been established to assist you in learning to recognize these hand hazards and avoid them while using portable hand and power tools. There are five basic mechanical actions that can trap hands: shearing, rotating, in-running nip, puncturing; and smashing.

Hazards involving the use of power tools can be prevented by following **five basic safety rules**:

- Keep all tools in good condition with regular maintenance;
- Use the right tool for the job;
- Examine each tool for damage before each use;
- Operate the tool according to the manufacturer's instructions; and
- Provide and use the right protective equipment.

General Requirements

Hand and power tools, and similar equipment are to be maintained in safe condition. Tools are to be inspected before use, and taken out of service for repair or replacement when defects are found. Defective tools are to be identified with a tag reading "DO NOT USE," or equivalent, to identify that a tool needs repair or replacement.

Apex Personnel are to use the correct tool for the job they are performing. If necessary, they will stop their work to get the proper tool if their safety is at risk.

Personnel are not to use tools with excessive force so much that it exceeds a tool's breaking point or designed purpose. Power tools such as grinders, saws, and similar equipment must not have their wheels, blades, or reciprocating parts forced to cut or grind objects in such a way that the blade or wheel breaks, or disengages.

Personnel are to follow the manufacturer's recommended practices for each tool, hose, valve, filter, fitting, or equipment used. Hazardous, exposed moving parts of power tools need to be safeguarded. Such parts include belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains or other reciprocating, rotating or moving parts. Guards provide protection to the operator and others from the point of operation, in-running nip points, rotating parts and flying chips and sparks. Modifications such as removing, or repositioning guards or safety devices

over blades, wheels, or reciprocating parts is not permitted unless recommended by the manufacturer

When using power tools, personnel must not wear loose clothing, jewelry, personal protective equipment, or wear long hair in such a way that the tool could catch hold and pull the worker in to its operation.

Areas where power tools and machines are in operation must be made free of trip hazards and slippery surfaces. Power cords are not to accumulate, or be used in such a way that they create excessive trip hazards.

Portable pneumatic and electrically powered tools are to be disconnected from their power supply when the user is finished with its use. Power tools are not to be left with their power supply connected and the start switch exposed where workers may step on them, or inadvertently start the tool.

Machines designed for a fixed location are to be securely anchored to prevent walking or moving.

Personal Protective Equipment

Personnel using hand and power tools may be exposed to the hazards of falling, flying, abrasive, and splashing objects, harmful dusts, fumes, mists, vapors, gases, and/or noise. For this reason PPE should be used to protect against the existing hazard(s). Such equipment would include the following:

- Eye and face protection in the form of impact resistant glasses, face shields or goggles;
- Respiratory protection;
- Hand protection in the form of impact and abrasion resistant gloves with or with out additional chemical resistant gloves. Note: DO NOT use loose fitting gloves around rotating, reciprocating or moving parts;
- Hearing protection;
- Head protection like a hard hat;
- Specialty protective devices like vibration resistant gloves, metatarsal protection when using a steam cleaning wand, or welding leathers.

Training

Most hand tools can be operated safely by personnel by using the tool for its intended purpose and applying common sense. Other tools, like powder-actuated tools, may require a manufacturer's training course prior to being operated. Most powered tools require that workers become familiar with the tool by reading the manufacturer's instruction booklet.

Upon assignment to a project requiring Apex personnel to use a portable hand or power tool, they must indicate to their supervisor whether or not they have experience operating the designated tool or tools. If the worker requires instruction other than that provided by the

manufacturer, experienced Apex personnel will instruct the worker in the safe use of the tool, or the worker will be sent to an appropriate training session by a vendor or manufacturer.

Through subcontractor pre-qualification, it is anticipated that only subcontractors trained and able to safely operate portable hand and power tools will be selected for projects. If on the job site it is apparent that a subcontractor is operating a tool which he or she is unfamiliar with, the project safety officer will initiate corrective action.

Hand Tools

The following are general guidelines to be followed when using hand tools. These guidelines relate to common misuses or cases when a tool should be taken out of use.

- Wrenches are not to be used when jaws are sprung to the point that slippage occurs;
- Impact tools, such as drift pins, wedges, and chisels, are to be kept free of mushroom heads;
- Wooden handles of tools are to be kept free of splinters or cracks, and must be kept tight in the tool;
- Chisels are not to be used as screwdrivers, or screwdrivers used as chisels;
- Always carry saw blades, knives or other tools with the edge pointed away from the body; and
- Dull tools like scissors and knives are typically more dangerous than sharp tools.

Electrically Powered Hand Tools

Among the chief hazards of electrically powered tools are burns and shock. To protect the user from shock, tools must either have a three-wire cord with ground and be grounded, be double insulated, or be powered by a low-voltage isolation transformer.

The use of electric cords for hoisting or lowering tools is not permitted. Electric cords must be protected from strain, cuts, bums, crushing, chemicals, or damage.

Ground-fault circuit interrupter (GFCI) protection shall be provided on all receptacle outlets that are not part of the permanent wiring of a building serving portable electric hand tools or semi-portable electric power tools (such as block/brick saws, table saws, air compressors, welding machines, and drill presses), except when:

- An Assured Equipment Grounding Conductor Program is established (See Section 10.9); or
- When double insulated tools that do not require grounding are used (tools used in wet weather or near water require GFCI protection); or
- When generators meeting the grounding exemptions of the National Electrical Code 250-6 are used.

Electric tools that are "hard-wired" directly to an electrical source or power shall be GFCI protected by a GFCI-type circuit breaker. Refer to Section 10.9, Electrical Protection Program for Workers on Construction Sites, for additional guidance on electric tool safety.

Pneumatic Power Tools

Pneumatic tools are powered by compressed air; they include chippers, drills, hammers and sanders. Among the hazards associated with pneumatic powered tools are the release of pressure should a fitting or hose fail, and noise.

Hoses used in conjunction with pneumatic power tools must be prevented from disconnect by the use of safety clips or retainers. The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings must not be exceeded. All hoses exceeding one-half inch inside diameter are to have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

The use of hoses for hoisting or lowering tools is not permitted.

All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 psi pressure at the tool are to have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.

Abrasive blast cleaning nozzles are to be equipped with an operating valve which must be held open manually. A support is to be provided on which the nozzle may be mounted when it is not in use.

Fuel Powered Tools

The principal hazards associated with fuel (usually gasoline or diesel) powered tools is the flammable nature of the fuel which can lead to fire and explosion, and the inhalation of tool exhaust with contains toxic gases such as carbon monoxide.

All fuel powered tools are to be stopped while being refueled, serviced, or maintained. Before refueling engines of tools, allow the tool to cool down. Tools must not be refueled near a source of ignition.

When fuel powered tools are used in enclosed spaces, there must be adequate ventilation to prevent concentrations of gases from accumulating in the space. A fire extinguisher should always be available when using fuel powered equipment.

Powder-Actuated Tools

Powder actuated tools are used to make forced-entry fastenings in various construction materials. These tools operate like loaded guns and should be treated with the same respect and precautions.

Personnel using powder-actuated tools must be trained and in possession of a proof of training on that tool. Documentation of such training should be maintained by Apex EHS personnel.

Before powder actuated tools are used, they must be inspected to determine that the tool is clean, all moving parts operate freely, and that the barrel is free from defects and all safety devices are working correctly.

The tool is not to be loaded unless it will be used immediately. When used, it must not be pointed at other persons, and the user must keep their hands and extremities clear of the barrel before firing. When loaded, the tool must not be left unattended.

Cartridges are to be selected appropriately so work will be performed without excessive force. Necessary care must be used to confine flying fragments or particles which might create a hazard when the tool is fired.

If the tool misfires, the user is to wait 30 seconds, and then fire again. If it misfires again, wait another 30 seconds so that the faulty cartridge is less likely to explode, then remove the load. The bad cartridge should be put in water. Unused cartridges are to be picked up and not left lying on the job.

Fasteners are not to be driven into very hard or brittle materials such as cast iron, glazed tile, surface-hardened steel, glass block, or hollow tile. Driving into materials easily penetrated must be backed by a substance that will prevent the fastener from passing through and creating a flying missile hazard on the other side.

Power Abrasive Wheel Tools

All grinding machines are to be supplied with sufficient power to maintain spindle speeds at safe levels under all conditions of normal operation.

Before abrasive wheels are mounted, they must be inspected closely for cracks or defects. The wheel must fit freely on to the tool's spindle without force, and must be snug. The spindle nut is to be tightened enough to hold the wheel in place.

Hand-held grinders are not to be clamped in a vise.

Woodworking Tools

All fixed power driven woodworking tools are to be provided with a disconnect switch that can either be locked or tagged in the off position.

All saws are to be supplied with sufficient power to maintain operating speeds at safe levels under all conditions of normal operation. Only blade types recommended by the manufacturer should be used.

The protective guards of hand-held saws are not to be wedged up-ward during use. In-between use, they are to be placed with the blade side of the saw downward to the surface they are resting on, or hanging from their handle at a cutting table, safe from contact with other persons.

Hydraulic Power Tools

The fluid used in hydraulic power tools is to be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperature to which it will be exposed. Hydraulic pressurized hoses have been known to fail without much notice. For this reason it is critical that the condition of hoses and clamps be evaluated during each use of such equipment. Preventive maintenance on such equipment is also critical.

Personnel using hydraulic powered equipment should be prepared for hydraulic fluid spills by having a spill kit near by. A spill kit should include the following, as a minimum: bucket, shovel, spill pillow or pig, chemical resistant gloves, safety glasses, and extra rags for wiping down sprayed surfaces.

Jacks

Jacks must be inspected before each use, and lubricated regularly. If a jack is subjected to an abnormal load or shock, it is to be re-examined for damage. Jacks exposed to freezing temperatures are to be filled with an adequate antifreeze liquid.

All jacks must have a device which stops them from jacking up too high. Jacks must have the manufacturer's load limit permanently marked on them or they are not to be used.

Jacks are not to be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Wooden blocking is to be used under the base if necessary to make the jack level and secure. If the lift surface is metal, a minimum of one-inch hardwood block or equivalent is to be placed between it and the metal jack head to reduce the danger of slippage.

When jacks are set up, the base must rest on a firm level surface, correctly centered. The jack head must bear against a level surface, and the lift force applied squarely.

References

- OSHA 29 CFR 1926 Subpart I, Safety and Health Regulations for Construction, Tools – Hand and Power
- A Prevention Manual for Business and Industry. Engineering & Technology, 11th edition. National Safety Council 1997.
- Booklet No. 3080 Hand and Power Tools, OSHA 1986.

HOISTING AND RIGGING

Apex employees may sometimes be expected to participate in proper materials handling operations during daily work routine. Some of these materials though, will be too heavy or bulky for individual or tandem movement, and powered mobile lifting equipment will be needed for safe movement. Examples are forklifts, derricks, crawler locomotive and truck cranes, and overhead/gantry cranes.

Only trained, certified, and authorized operators are ever allowed on this equipment. They are ultimately responsible for their own safety as well as the safety of their fellow coworkers. By recognizing potential dangers and making correct decisions, you can help ensure the safety of yourself and those around you at the job site.

The following information is provided as minimum guidelines for the care and use of chains, slings and rigging equipment. Types of slings include alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope, and synthetic web

Steel Chain

Wire rope (cable)

Wire Mesh

Synthetic Web (nylon)

Training

Initial training shall be completed prior to an employee's assignment to a job task requiring the use of chains, slings and rigging equipment.

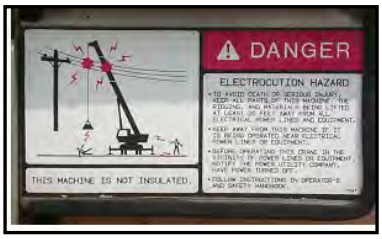
Refresher Training

- Refresher training shall be conducted at least annually or as needed as job tasks or equipment changes require; and
- Refresher training shall also be required immediately following any incident, near miss or operating violations involving the use of chains, slings and rigging equipment.

Hazard Determination

Hazard determinations may include but are not limited to the following:

Overhead Power Lines – Warning:



- Never operate any crane near electrical power lines. Auto crane companies recommend that a crane, rigging and load being lifted never be moved any closer to a power line (including telephone lines) than 20 feet at any point.
- If it is necessary that the crane or equipment being lifted would come closer than 20 feet to any power line in order to complete the job, then the electrical company which owns or controls the power line shall be notified and the power line will be de-energized or disconnected for the duration of the lift.

Weight of the Load

Weight of load to be lifted shall be evaluated before lift is made. The weight of the load, center of load balance and attachment points for rigging should be reviewed before the lift is made. Tag lines shall be

used unless their use creates an unsafe condition.

Pinch Points

Keep hands, fingers and feet from coming in contact with load and rigging that could result in an injury.

Weather Conditions

It is important to ensure that the crane or wench truck lifting a load is stable. Muddy or slick conditions could result in a sudden movement of the crane or wench truck, causing the rigging to slip and the load to fall.

Chemicals

When synthetic web slings are used, the following precautions shall be taken:

- Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present;
- Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquid caustics are present; and
- Aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

Equipment Condition

All slings shall be removed from service if they are damaged or defective. Rigging equipment not in use shall be removed from the immediate work area so as not to present a hazard to employees.

End Attachments

Any homemade attachment devices (e.g., homemade lifting devices) will be engineered, load tested and certified.

Engineering Controls

Engineering controls may include but are not limited to the following:

- Review the lifting process to ensure it is necessary to lift using chains and slings. Alternate lifting methods may be safer (forklift, etc.);
- Review the lifting process to ensure it is feasible and reasonable to lighten the load;
- Review process to ensure as few lifts as possible are made (less handling versus less weight);
- Review the lifting process to ensure non-essential personnel are clear of the area; essential personnel shall be at a safe distance from the lifting object; and
- Review the lifting process to ensure loads are not lifted higher than necessary.

Operating Rules:

All materials handling gear and equipment provided by Apex or its subcontractor shall be inspected by Apex or its subcontractor or an authorized representative before each use and when necessary, at intervals during its use, to ensure the safety of the equipment.

- Know the weight of the load to be lifted and/or moved.
- Use a sling with characteristics for the type of load hitch and environment.
- Never load a sling in excess of its rated capacity.
- Never tie a knot in a sling nor use a sling with a knot in it.
- Protect the sling from being cut by sharp corners, edges, and abrasive surfaces by using wear pads, sleeves or "softeners" when necessary.
- Ensure the sling is securely attached to the load.
- Do not stand near or under a suspended load and keep it clear of other obstructions.
- Do not drag a sling across the floor, over abrasive surfaces, or from under a load.
- Do not shock load (jerk) when lifting.
- Lift the load no higher than necessary to get the job done.
- Remove damaged slings immediately.
- Always refer to load chart when determining the proper rigging.

Inspection Records

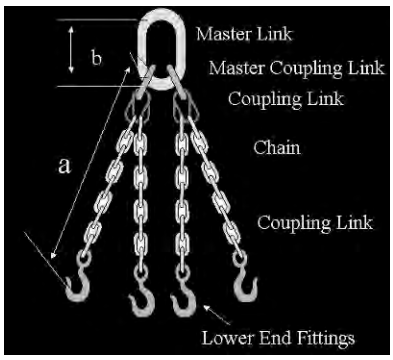
Inspection records are to be maintained on all material handling equipment and shall contain at least the following information (see Appendices):

- Type of sling;
- Serial number of sling;
- Type of material (chain, wire rope, synthetic fiber, etc.);
- Date purchased;
- Date placed into service;
- Last date of inspection;
- Condition (wear, defects, deformation, increase in length);
- Date repaired; and
- Date removed from service.

Chain Slings

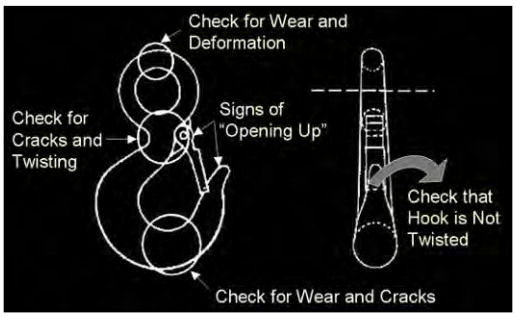
Chains are commonly used because of their strength and ability (Grade-A material) to adapt to the shape of the item being moved. Signs of chain wear, stretching, nicks, and gouges indicate the chain needs to be removed from service and replaced.

Alloy-steel chain (grade 8) is approximately twice as strong (size for size) as wrought iron chain. Alloy-steel chain has



View of quadruple leg sling

become the standard material for chain slings and should be purchased complete with load test certifications and certification tags. Wrought iron should not be used.



Types of Chain Slings

In addition to chain size, and component parts of a chain sling, the number of legs also determines the amount of weight that can be lifted safely. Sets of chains are often referred to by chain size and a set of initials referring to the components of the sling.

Inspection

In addition to the visual inspection that is required prior to each use, all slings are to receive regular (monthly and annually) detailed inspections which are documented. The inspection shall include observation/measurement for:

- Wear;
- Defective welds;
- Deformation; and,
- Increase in length.

Chain slings shall be removed from service when, due to stretch, the increase in length of a measured section:

- Exceeds five percent;
- When a link is bent, twisted or otherwise damaged; or
- When raised or defective welds appear.
- Alloy steel chain slings shall be permanently removed from service if they are heated above 1000o F. When exposed to service temperatures in excess of 600o F, maximum working load limits permitted in Table N-184-1 (OSHA 29 CFR 1910.184) shall be reduced in accordance with the chain or sling manufacturer's recommendations.

Repairs shall be made only by persons trained and qualified to make repair to chains. Manufacturer's guidelines shall be observed. Links or portions of the chain found to be defective shall be replaced by links having proper dimensions and made of material similar to that of the chain.

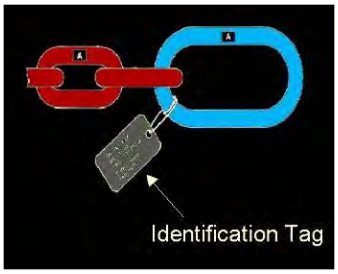
Chains shall be proof tested to the test load recommended by the manufacturer **PRIOR** to returning the chains to service.

Attachments

- Chain attachments (rings, shackles, couplings, and end links) are to be made of the same material to which they are fastened.

- Hooks should be made of forged or laminated steel and should be equipped with safety latches. Hooks that have been overloaded or loaded on the tips and have a permanent set greater than 15 percent of the normal throat opening are to be replaced.

Practice and Use



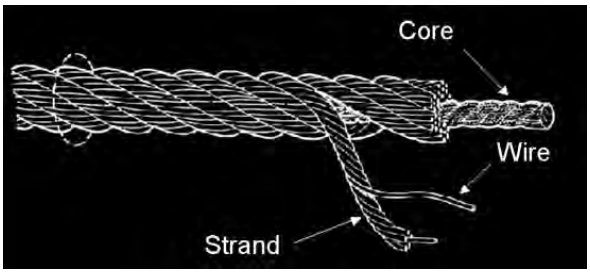
The following general rules apply to the use of alloy-steel chain slings:

- A load shall not be lifted with a chain having a kink or knot in it;
- A chain shall not be shortened by bolting, wiring, or knotting;
- Standard tables shall be used to determine the maximum safe working loads of various sizes of alloy steel chains and chain slings (29 CFR 926.251 and 29 CFR 1910.184);
- Each chain shall be tagged to indicate its identification or serial number and load capacity;
- The lifting capacity (i.e., 10,000 pounds) is based upon the recommended practice of lifting with the legs of the sling attached to the workload at a 60-degree angle. As the degree of the angle of hook-up is decreased, the lifting capacity is also decreased.

Wire Rope Slings

Wire rope is composed of individual wires that have been twisted to form strands, which are then twisted again to form a rope. Four characteristics should be considered when choosing a wire rope:

- Strength.
- Ability to bend without distortion (fatigue).
- Ability to withstand abrasive wear.
- Ability to withstand abuse.



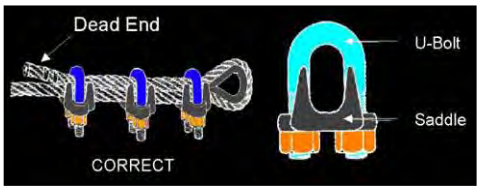
Strength of a wire rope is a function of its size, grade, and construction. It must be sufficient to accommodate the applied maximum load. One of the most dependable and economical tools of the industry, wire rope is also one of the least understood. The following information is intended to increase understanding of this seemingly complex product.

Working Load

The safe working load recommended by the manufacturer shall be followed.

Construction and Component Parts of Wire Rope Slings

The eyes of a sling must be formed or spliced in order to maintain the safe working load of the sling throughout its use. The type of end fastenings is also a factor in determining the safe working load of the sling.



Protruding ends of strands in splices on slings and bridles must be covered or blunted.

Where U-bolt wire rope fasteners are used to form eyes, the U-bolt shall be applied so that the U-section is in contact with the dead end of the rope. Clip fasteners shall be installed in the number recommended for the rope size:

1/4 to 5/6 inch	**3 clips;**	***Clips shall be spaced a minimum distance of 6 times the rope diameter.***
3/4/ to 1 inch	**4 clips;**	
1 1/8 to 1-1/2 inch	**5 clips;**	
1 3/8 to 1-1/2 inch	**6 clips;**	

Fatigue

A wire rope must have the ability to withstand repeated bending without the wires failing from fatigue. This is often the result of small cracks developing in the wire from repeated applications of bending loads. It occurs when ropes make small radius bends. The best prevention of fatigue is to use blocking or padding to increase the radius of the bend.

Inspection

Wire rope must be inspected often but not less that the following guidelines:

- Wire rope slings shall be inspected before each use.
- Wire rope slings shall be inspected and lubricated periodically (monthly and annually) or at first sign of corrosion.

Wire rope must not be used as load lifting gear if: the reduction of rope diameter is below nominal diameter due to loss of core support; internal or external corrosion; or wear of outside wires.

There are a number of broken outside wires and the degree of distribution or concentration of such broken wires, or the rope shows other signs of excessive wear, corrosion or defect such as:

- Worn outside wires;
- Corroded or broken wires at end connections;

- Corroded, cracked, bent, worn, or improperly applied end connections;
- Severe kinking, crushing, cutting, or unstranding;
- Greater than 3 broken wires in a single lay of a strand; or
- Greater than 6 broken wires in a single lay of the cable.

Webbing Slings

No one synthetic webbing can handle all jobs in all conditions, three kinds of synthetic webbing slings are generally available:

Nylon slings

Unaffected by grease or oil. Good chemical resistance to aldehydes, ethers, and strong alkalis. **Do not use** for acids and bleaching agents. Not suitable for use at temperatures exceeding 250° F. Stretch at rated capacity should not exceed 0%.

Polyester slings

Unaffected by common acids and hot bleaching solutions. **Do not use** with concentrated sulfuric acid or alkalies. Not suitable for use at temperatures exceeding 250° F. Stretch at rated capacity is approximately 3%.

Polypropylene slings

Unaffected by acids and alkalies. Not suitable for use at temperatures exceeding 180° F. Stretch at rated capacity is approximately 10%.

Inspection

Always inspect a sling before you use it. Periodic detailed inspections should be conducted and recorded monthly and annually.

The identification tag should have:

- The length;
- The rated capacity for each type of hitch;
- The type of material, and may have other information such as manufacturer's name; and
- Sling serial number.

When inspecting webbing sling, the following common types of damage should be considered:

- Melted or charred spots;
- Acid or caustic burns;
- Weld spatter holes;
- Broken stitching;
- Cuts or tears;
- Damaged eyes or fittings;
- Excessive abrasive wear; and,

- Knots.

Manufacturers make into slings red, green, or blue warning fibers. Where these are observed due to cuts or wear, the sling must be deemed out of service.

If a sling is found to be damaged, take it out of service immediately. Never attempt to make temporary repairs. End fittings may be salvaged for a new sling, provided they are still within tolerance.

References

- OSHA 29 CFR 1926.251 – Rigging Equipment for Material Handling
- OSHA 29 CFR 1926.753 – Hoisting and Rigging
- OSHA 29 CFR 1926.955 – Overhead Lines
- OSHA 29 CFR 190.184 – Slings
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)
- National Institute for Occupational Safety and Health - NIOSH

FALL PROTECTION

Apex personnel are exposed to potential falling hazards. These can include working atop elevated work platforms, buildings, vehicles, and tanks, or using ladders. It may also include the falling of objects onto personnel.

Fall hazards may also exist from construction activity being performed at Apex work sites, which Apex employees may visit, inspect, or have occasion to work.

Injuries to Apex employees associated with falls, particularly at a worksite, constitute a serious potential hazard.

This section provides standardized safety guidelines in preventing and controlling falls, and establishes responsibility in implementing fall protection safety.

Employee Responsibilities

Project Managers

Project Managers are expected to provide leadership and serve as examples in the effective administration of this policy. This would include:

- Accepting overall responsibility for fall protection.
- Holding all employees and their supervision accountable for compliance with all safety rules, regulations, codes, standard operating procedures, and practices.
- Ensuring that all fall-related occupational injuries are reported.
- Reviewing all fall-related accident and injury reports, and taking appropriate corrective action.

- Initiating appropriate disciplinary action when violations of safety rules, regulations, codes, standard operating procedures, and practices occur.

Supervisors

Supervisors, those with direct oversight of employees, serve a vital role in the successful implementation of the fall protection program. Because supervisors are responsible for overseeing the daily activities of the workforce, they are best able to enforce the policies and also to observe any problems that need to be addressed on a program level. Specific responsibilities include:

- Planning all jobs so that safety and fall prevention are an integral part of the work procedures.
- Providing proper safety orientation and training as required by Apex prior to assigning new tasks to employees.
- Providing employees with the proper tools and equipment to safely perform their jobs.
- Inspecting all work activities under their supervision to ensure that all appropriate safety rules, regulations, codes, standard operating procedures, practices, and equipment are used.
- Investigating all accidents involving falls promptly and thoroughly.
- Following through on recommendations made during accident investigations.
- Setting an example by complying with all workplace safety guidelines.
- Immediately shutting down work at any site where serious safety hazards are observed which could endanger an employee, contractor, vendor, or a member of the public.

Employees

Employees are the most important part of an effective fall protection safety program because they are faced with the actual fall hazards. Their specific responsibilities include:

- Complying with all safety rules, regulations, codes, standard operating procedures, and practices regarding fall protection.
- Ensuring that they understand all assignments before undertaking them.
- Using all protective gear and safety equipment provided for the job.
- Reporting any unsafe acts or conditions immediately to supervision.
- Consulting the EHS specialists or supervisor if there is any question regarding the safety of an operation.

EHS Specialists

The EHS specialist is responsible for assisting management in formulating and implementing an effective fall protection program. Specific responsibilities include:

- Providing technical expertise in the development of safety rules, regulations, codes, standard operating procedures and practices.

- Monitoring Apex facilities, equipment, and activities to ensure compliance with all federal, state, and local safety rules, regulations, codes, standard operating procedures, and practices.
- Ensuring that management is advised of any changes in safety rules, regulations, codes, standard operating procedures, and practices which affect the fall protection program.
- Reviewing all accident and injury reports related to fall protection.
- Assisting in the development of fall protection training materials for safety training classes.

General Requirements

Ladders

Requirements to be followed when using temporary, or portable ladders:

All ladder stands / platform ladders must:

- Be used by only trained personnel;
- Be used only for the approved and intended purpose;
- Be inspected frequently to ensure their safe working condition;
- Be used only on flat/level floors.

Do not use ladder stands / platform ladders within ten (10) feet of electrical lines.

Stepladders

Stepladders must:

- Be used by only trained personnel;
- Be used only for the approved and intended purpose;
- Be inspected frequently to ensure their safe working condition;
- Be used only on flat/level floors;
- Be placed so those employees climbing are not exposed to injury from projecting objects or doors that open toward the ladder;
- Be supported by another person or other means to ensure stability, if greater than ten (10) feet;
- Be at least 36 inches above the upper support level if employees are to leave or mount the ladder at that level, except that where such extension is impractical other equivalent means such as grab bars may be used to provide a grip.

Do not use stepladders:

Within ten (10) feet of electrical lines.

- As braces or skids;
- As platforms, runways or scaffolds;
- As single straight ladders, except for combination ladders;

- That have defective/broken/split/missing – rungs, cleats, steps, side rails, bolts, rivets, fastenings, ropes, or any other structural defect;
- That are made of metal and wire-reinforced wooden side rails, when employees on the ladder might come into contact with energized electrical conductors.

Non-self supporting portable ladders

Non-Self-Supporting Portable ladders (i.e., single, extension, sectional) must:

- Be used by only trained personnel, only for approved purposes, and inspected frequently for safe condition;
- Be equipped with positive stops, which will ensure the overlap specified in the table above and equipped with the hardware fittings necessary if the manufacturer endorses extended uses;
- Not exceed 30 ft. (single ladder), 48 ft. (two-section ladders), and 60 ft. (over two-section ladders);
- Be placed with a secure footing and set at the proper angle. A simple rule is to place the base a distance from the vertical wall equal to one-fourth the working length of the ladder;
- Be placed so those employees climbing are not exposed to injury from projecting objects or doors that open toward the ladder and the employee ascended or descended facing the ladder;
- Have the top of the ladder placed with the two rails supported, unless equipped with a single support attachment and be tied off at the top or supported by another person;
- Be at least 36 inches above the upper support level if employees are to leave or mount the ladder at that level, except that where such extension is impractical other equivalent means such as grab bars may be used to provide a grip;
- Be limited to one-man working on ladder, based on a 200-pound load;
- All defective or damaged non-self-supporting portable ladders must:

Do not use non-self-supporting portable ladders:

- That are made of metal and/or wire-reinforced wood, within ten (10) feet of electrical lines;
- As guys, gin pole, gangway, braces, skids, platforms, runways, or scaffolds;
- That have defective/broken/split/missing – rungs, cleats, rails, bolts, rivets, fastenings, ropes, or any defect.
- Standards for manufactured portable ladders shall bear identification indicating that they meet ANSI A14.1-1981, ANSI 14.2-1082 or ANSI 14.3-1981 requirements.

All defective or damaged ladders must:

Be immediately removed from service and not used until repaired or replaced and;

Be designated by a sign or tag indicating the hazardous condition

Guardrails

- Required on all open sides of roof openings, open sides of landings, tanks, balconies, porches, platforms, runways, ramps, or other work levels more than 30 inches above the floor or ground.
- Consist of 42-inch top rail and 21 inch midrail. If the platform is 6 feet or more over a work area, a 3 1/2 inch toeboard must also be installed under the guardrails.
- Support at least a live load of 20 pounds per linear foot, and more if heavier loads will be applied.
- If chains are used as a top rail and midrail, they must be taut at all times when in position, and shall not deflect more than 3 inches when a load of 200 pounds is applied in any direction.

Roofs

- Guardrails are required at locations where there is a routine need for any employee to approach within 6 feet of the edge of the roof.
- When intermittent work is being done, life lines, safety belts/harnesses, or equivalent protection may be provided in lieu of guardrails.

Fixed Industrial Stairs

Guidelines for fixed industrial stairs are detailed in Section 10.12.6.

Floor Openings and Open Sides

Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment shall be guarded with a standard railing/midrail and toeboard. Additional information on floor openings is provided in Section 10.12.5.

Fall Protection, Construction Site

It is not anticipated that Apex employees will have a high potential for exposure to falls, such as from scaffolds, single-cleat ladders, double-cleat ladders, roof tops under construction, or into open trenches at construction sites. If the possibility of exposure to these hazards exists, Apex employees entering a construction worksite must abide by the standards governing that worksite, which often times differ from general industry safety standards and are noted in this section as a reference.

Construction Site Fall Protection Standards

Criteria:

Fall protection must be provided to all employees exposed to falls of 6 feet or more.

Protection from Falling Objects:

- Exposed employees shall wear a hardhat;
- The construction site safety plan must be designed to actively prevent falling objects; and

- Toeboards 3.5 inches high should be installed where objects could roll or falloff an elevated work surface. If necessary, screens may be needed to retain any potential falling objects.

Construction Site Guardrails:

- Top rails must be 42 inches, plus or minus 3 inches.
- Midrails should be installed 21 inches high, approximately in between the ground and top rail.
- Openings in the guardrails should not exceed 19 inches.
- The guardrails must be constructed to withstand a force of 200 pounds applied either downward or outward.
- Midrails must be constructed to withstand a force of 150 pounds applied either downward or outward.
- If wire rope is used as a top rail, it must be flagged every 6 feet. The rope must be taut at all times when in position, and shall not deflect more than 3 inches when a load of 200 pounds is applied in any direction.

Safety Net Systems:

- The safety net must be positioned as close as practical below the operation, but in no case more than 30 feet.
- The net must be accompanied by a performance certification or records of ongoing drop testing.
- The outward extension of safety nets must comply with the following:
- Weekly and after-impact inspections must be completed.
- The openings in the net cannot be greater than 6 inches on any side.
- Border ropes of the net must have a 5,000-pound breaking strength. Any connections of nets must not be more than 6 inches apart.

Personal Fall Arrest Systems:

Full-body harnesses provide evenly distributed shock-absorption for the wearer.

Positioning Devices:

- No more than 2 feet of free fall is permitted when using a fall arrest system for positioning.
- All equipment must be inspected before each use.
- Body belts can be used as part of a positioning device

Warning Line System:

- Erected around all sides of roof work area.
- No mechanical equipment may be used within 6 feet of the edge.
- If mechanical equipment is in use, it must operate 6 feet parallel to direction of equipment or 10 feet on sides perpendicular to equipment travel.

- The marked area must be flagged with high visibility material, no lower than 34 inches nor higher than 39 inches.

Controlled Access Zone:

- A controlled access zone is a work area designated and clearly marked in which certain types of work may take place without the use of conventional fall protection systems--guardrails, personal arrest, or safety net--to protect employees working in the zone.
- These zones are used to keep out workers other than those authorized to enter work areas from which guardrails have been removed. Control lines shall consist of ropes, wires, tapes or equivalent materials, and supporting stanchions, and must be:
- Flagged or otherwise clearly marked at not more than 6- foot intervals with high-visibility material.
- Supported in such a way that the lowest point is not less than 39 inches nor more than 45 inches from the working surface.
- Strong enough to sustain stress of not less than 200 pounds.
- Extended along entire length of the unprotected or leading edge.
- Connected on each side to a guardrail or wall.

Safety Monitoring System:

- When other standard fall protection methods are deemed not feasible, the construction contractor may implement a safety monitoring system. This is administered by a "competent" person who is:
- Competent in recognizing fall hazards
- Capable of warning workers of fall hazard dangers and in detecting unsafe work practices
- Operating on the same walking/working surfaces of the workers and can see them
- Close enough to work operations to communicate orally with workers and has no other duties to distract from the monitoring function.
- Mechanical equipment shall not be used or stored in areas where safety-monitoring systems have been implemented for roofing operations on low-sloped roofs.

Rescue:

- The employer shall provide for prompt rescue of employees in the event of a fall or shall assure the employees are able to rescue themselves.

Covers:

- Covers subjected to vehicular traffic must be designed to withstand 2 times the maximum axle load of the largest vehicle.
- Covers subjected to foot traffic must be designed to withstand 2 times the maximum weight of the expected load.
- Covers must be secured to prevent displacement. The covers should be marked or color coded

Fall Protection Plans

This option is available only to employees engaged in leading edge work, precast concrete erection work, or residential construction work (See OSHA 29 CFR1926.501(b)(2), (b)(12), and (b)(13) who can demonstrate that it is infeasible or creates a greater hazard to use conventional fall protection equipment. The fall protection plan must:

Document reasons why the use of conventional fall protection systems is infeasible or would create a greater hazard.

- Be prepared and updated by a qualified person. No changes to the plan can be made without the approval a qualified person.
- Be maintained at the job site.
- Be implemented under the supervision of a competent person. Include a discussion of alternate safety measures. Identify all locations affected by the plan.
- List all authorized employees affected by the plan by name.

Fall Protection Training

- All affected Apex employees working on a construction site must receive training.
- Someone designated as a "Competent Person" must conduct the training.
- The training needs to cover: types of fall hazards, procedures for erecting, maintaining, disassembling and inspecting fall protection systems, roles and responsibilities, handling and storage of equipment, and the OSHA standard.
- Training must be documented.
- Periodic retraining must be conducted to insure employee awareness and comprehension.

References

- OSHA CFR 29 1926 Subpart M – Fall Protection
- OSHA CFR 29 1910.25, Portable wood ladders
- OSHA CFR 29 1910.26, Portable metal ladders
- ANSI A14.1-1981 Safety Requirements for Portable Wood Ladders;
- ANSI A14.2-1982 Safety Requirements for Portable Metal Ladders;
- ANSI A14.5-1981 Safety Requirements for Portable Reinforced Plastic Ladders.

PERSONNEL AND EQUIPMENT DECONTAMINATION

The purpose of this section is to describe Equipment and Personnel Decontamination procedures as a means for control of potential migration of chemicals or other site contaminants to clean areas, and to prevent personnel exposure to chemicals or pathogens that may contaminate clothing or protective gear.

Decontamination General Procedures

Personnel who the Exclusion Zone (EZ) during field activities must decontaminate upon exit from the EZ. All personnel, including visitors, must enter and exit the EZ through the

decontamination area, known as the contamination reduction corridor. In addition, before demobilization, contaminated equipment will be decontaminated before it is moved into the clean zone. Refer to section 10.2 Hazardous Waste Operations and Emergency Response for a description of "work zones," their configuration and characteristics. Any material that is generated during decontamination procedures will be labeled and stored until final disposal arrangements are made.

The type of decontamination solution to be used is dependent on the type of chemical or pathogenic hazard. All personnel will be required to wash their hands (and face optional) with soap before eating, drinking (unless specific procedures are in place to ensure that a drink can be taken without the possibility of contamination), and before leaving the contamination reduction zone. Decontamination solutions will be changed daily (at a minimum) and collected and stored on-site until disposal arrangements are finalized.

Portable Equipment Decontamination

Equipment used in the EZ in areas where contact with site contaminants is likely to occur will be protected from contamination as much as possible by measures such as enclosure in plastic bags, or by preventing contact with contaminated materials. Equipment decontamination will be determined by the nature of the equipment and extent of contamination.

Equipment removed from the EZ before the end of the job will undergo a gross decontamination step near the work site prior to proceeding to the decontamination area. This step will help to ensure that as many of the contaminants as possible remain in the area.

This decontamination step may involve scraping and rough brushing to remove dirt and other visible contamination.

Heavy Equipment and Vehicle Decontamination

Heavy equipment and vehicles involved with site work or construction associated with potentially contaminated material will be decontaminated in a designated decontamination area upon leaving the EZ. The equipment decontamination area will be segregated, lined with plastic, and bermed as required. All heavy equipment, non-disposable equipment, and supplies will be cleaned in this area. Employees engaged in equipment and vehicle decontamination will wear adequate PPE to protect from splashes.

Procedures for Personnel Decontamination

All personnel will go through decontamination before leaving the EZ for the support zone or other clean areas. Personnel will also go through decontamination if their protective clothing becomes torn. Personnel may return to the EZ after changing into clean protective gear. This decontamination procedure applies to personnel at the site wearing Level C, or Level D PPE with chemically impervious clothing. As stated previously, minimum Level D PPE is expected for all site work activities. Actual decontamination procedures followed in the field will be modified, as necessary, based on the Level of PPE used. Consult the Occupational Safety and

Health Guidance Manual for Hazardous Waste Site Activities by NIOSH/OSHA/USCG/EPA for decontamination procedure for Level A and B PPE.

Station 1: Equipment Drop – Deposit equipment used on site (tools, sampling devices, monitoring instruments, radios, etc.) on plastic drop cloths. These items must be decontaminated or discarded as waste prior to removal from the EZ.

Station 2: Outer Boot and Outer Glove Wash and Rinse – Scrub outer boots, outer gloves, and/or splash suit (if used) with decontamination solution or detergent water. Rinse off with water.

Station 3: PPE Removal – Remove outer boots and gloves. If outer boots (boot covers) are disposable, deposit in container with plastic liner. If non-disposable, store in a clean, dry place. Gloves are to be discarded daily unless appropriate decontamination is achieved. Remove the outer garment and deposit in a plastic-lined container. Then remove the respirator and dispose of cartridges. Wash respirator in detergent or sanitizer solution. Wipe off and store the respirator in a clean dry area. Finally, remove the inner gloves and deposit in a container for disposal. PPE will not be removed prior to decontamination.

Station 4: Field Wash – Personnel will proceed to the washroom or a hand wash station and wash thoroughly before eating or leaving the site. Facilities will be available in the decontamination area. This area will include a location to discard work clothing and store street clothing.

General Decontamination Procedures

The following decontamination procedures and guidelines will be implemented:

- Any respirators used will be inspected and washed in soapy water, if necessary, or at least at the end of each work shift. All respirators used will be disinfected with sanitary wipes or sanitizer solution every day. All respirators will be stored in sealable plastic bags in a location that is free from chemical or biologic hazards, ultra violet light and temperature extremes.
- Use of disposable protective clothing will eliminate the need for extensive evaluation of clothing to determine the effectiveness of decontamination procedures.
- The decontamination sequence will be designed to prevent or minimize direct contact with waste materials.
- All contamination wash water and residues will be collected on site, tested, and disposed of accordingly.
- All disposable protective clothing and contaminated material will be collected in plastic sacks and disposed of appropriately. Non-disposable clothing will only leave the site for commercial laundering at the end of the project when it will leave the site only after appropriate decontamination.

In addition to these decontamination facilities, adequate sanitary facilities will be provided.

Contaminant Control

This section outlines the measures that will be taken to control contamination and prevent it from leaving the EZ. The decontamination procedures described above will be the primary sources of contaminant control. Also, as indicated previously, all wastewater generated from decontamination procedures will be collected on site, tested, and disposed accordingly. In addition to these procedures, measures will be taken to limit the movement of dust and vapors that may be generated within the EZ.

Eating, drinking, smoking, chewing, and application of cosmetics will be restricted to the clean zone (support zone), except drinking of replacement fluids, which will be permitted in designated areas of the contamination reduction zone, under strict protocol to prevent the ingestion of contaminated material.

Personnel returning from the EZ or decontamination zone will thoroughly cleanse their hands, faces and other exposed areas at the decontamination facility before smoking and eating.

Decontamination Waste Handling and Disposal

Wastes generated, as a result of site activities will be handled in accordance with applicable environmental regulations. Unless otherwise specified, water used during personnel decontamination activities will be considered to be contaminated. Unless specifically stated, personnel are to treat decontamination wastes as part of the investigation derived wastes.

References

- OSHA CFR 1910.120 including Appendix A-E
- OSHA CFR 1926.65 including Appendix A-E
- US Army Corps of Engineers, Safety and Health Requirements Manual (EM-385-1-1)
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October 1985.

BOATING SAFETY

The following is a synopsis of some of the health and safety requirements relative to marine operations. This list is not complete, and other documents should be referenced relative to the performance of marine operations. These documents include:

- US Army Corps of Engineers Safety and health Requirements Manual, EM 385-1-1, Section 19
- USCG Regulations as codified in CFR Titles 33 and 46, and others, as applicable
- OSHA Regulations as codified in CFR Titles 29, and others, as applicable (e.g. 29 CFR 1926.106 – Working Over or Near Water)

General

The USACE refers to watercraft as *Floating Plants,* which are defined in EM 385-1-1 as "any marine vessel used to transport personnel, work boats, floating cranes and derricks, barges, patrol boats, etc." Depending upon the size and use of the watercraft on site, the health and safety requirements may vary. Procedures should be reviewed and updated as necessary as the vessels and use of onsite watercraft changes.

Inspection, Certification, and Registration

- All watercraft shall have current titles, registrations, and show proper decals as required by State. The State and local Boat Registration office should be contacted for the local watercraft certification requirements.
- All watercraft that are regulated by the USCG shall have current inspections and certificates issued by the USCG before being placed in service and a copy shall be posted in a public area on board the vessel.
- When any watercraft is brought onto the job site, it shall be inspected and documented by completing the applicable sections of the USACE Initial Safety Inspection Checklist. The equipment shall be determined to be in safe operating condition before use.
- A pre-use inspection of the watercraft must be performed by the operator before each daily use. Watercraft found in an unsafe condition shall be taken out of service and its use prohibited until unsafe conditions have been corrected.

Watercraft Inspections

State/Local Registrations
USCG Certification
Initial Inspection
Daily Inspections

Personnel Qualifications

- Personnel who will operate powered watercraft during the course of the project shall first demonstrate to the SSHO that they are experienced in operating watercraft similar to those used for the project and that they are knowledgeable of the USCG boating safety requirements (33 CFR Subchapter S). The watercraft operator shall be responsible for the safety of all personnel on board the watercraft he or she is operating and for the integrity of all watercraft and safety equipment.
- The designated watercraft operator is responsible for completing a Float Plan, if required by the SSHO. A Float Plan is used to inform on-land personnel the location of all project watercraft and personnel using them at all times. The instructions for completing the Float Plan are located at the top of the Float Plan which can be found in this Manual (see Appendices).
- All personnel who will be boarding watercraft, including passengers, must attend a brief one-time boating orientation session to be conducted by the SSHO.
- If required by USCG regulations, personnel operating watercraft shall be in possession of a current, valid USCG license, which shall be posted in a public area on board the vessel, or a correctly endorsed document as required by the USCG.

- Each designated watercraft operator shall give a safety briefing to all occupants of the watercraft prior to leaving the shore. Watercraft operators must be within radio contact range with other project personnel at all times when on the water.
- All operators must review and be familiar with the navigation charts of the area and be aware of the mean low water depths, and obstructions.

Equipment Requirements

A **Watercraft operators daily checklist** is included in this Manual (see Appendices) and should be completed by the designated watercraft operator prior to the use of all project watercraft.

All project watercraft will meet or exceed U.S. Coast Guard requirements for safety equipment.

Each watercraft shall carry fire extinguishers. Extinguisher requirements are as follows:

Length of Watercraft	Extinguisher Type	Number Required
26 Feet or Less	1-A:10-B:C	1
26 Feet or More	1-A:10-B:C	2

All watercraft shall carry at least one air horn or similar sound-signaling device.

- Each watercraft operated at night shall be equipped with navigation lights and these lights shall be utilized at all times when operating between sunset and sunrise. Navigational lighting shall be in compliance with USCG and USACE requirements.
- All watercraft shall carry a pyrotechnic and non-pyrotechnic visual distress signals. Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares. Non-pyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light.
- All powered watercraft shall carry a tool kit sufficient for the watercraft operator to troubleshoot common mechanical problems.
- Fenders shall be provided to prevent damage and to provide safe areas for workers exposed to pinching situations caused by floating equipment.
- A secondary means of propulsion (e.g. oars) must be kept on watercraft in case of engine malfunction.
- A bailer should be kept on all watercraft not equipped with self-bailing mechanism.

Safety Requirements

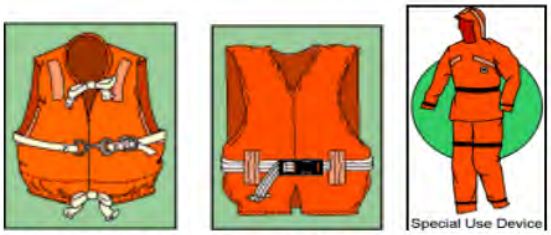
- The latest information published by the USCG regarding aids to navigation shall be maintained aboard vessels 26 feet (8 meters) or more in length.
- Provisions shall be made to prevent accumulation of fuel and grease on floors, decks and in bilges.
- Deck loading will be limited to safe capacity. Loads will be secured and holdbacks or rings will be provided to secure loose equipment during rough weather.

- Projection and tripping hazards shall be removed, identified with warning signs, or distinctly marked with safety-yellow paint.
- The Refuse Act of 1989 prohibits the throwing, discharging, or depositing of any refuse matter of any kind (including trash, garbage, oil, and other liquid pollutants) into the waters of the United States. The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances in quantities that may be harmful into U.S. navigable waters.
- The motor or engine utilized for propulsion must be no larger than that specified on the vessel stern plate.
- Non-slip surfaces shall be provided on all working decks, stair treads, walkways, etc.
- All means of access of access to watercraft shall be properly secured, guarded, and maintained free of slipping and tripping hazards.
- Personnel should utilize the "one-third rule" in watercraft fuel management, which is as follows: use one-third of the fuel to get to the destination, one-third to return, and keep one-third in reserve.

Personal Flotation Devices

A USCG approved Personal Floatation Device (PFD) shall be provided to and properly worn by all persons in the following circumstances:

- On all watercraft, including barges, floating plants, powered and non-powered vessels and boats, floating work platforms, floating pipelines, pontoons, etc;
- Any work on or near water where falling into the water is a potential hazard;
- Working alone at night where there are drowning hazards, regardless of other safeguards provided;
- Wherever there is a drowning hazard;
- All PFDs shall be Type I, III, or V;



Type·I·PFD¶ Type·III·PFD¶ Type·V·PFD¶

- Prior to and after each use, the PFDs shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used;
- PFDs must be equipped with retro-reflective tape as specified in 46 CFR 25.25-15; and
- Each watercraft shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water and grasped and held by the user until rescued. A lifering or horseshoe buoy are two common examples of a Type IV PFD. All Type IV PFDs must be approved by the SSHO prior to use. Liferings (rope attachment not required) and ring buoys (rope attachment required) shall conform to the requirements of 46 CFR 160 (USCG approval) and shall have at least 70 feet (21 meters) of 3/8 inch (1 centimeter) solid braid polypropylene line, or equivalent, attached.

Type IV PFD

- Life rings or ring buoys shall be readily available and shall be provided as follows:
- A minimum of one on each vessel;
- A minimum of one on all motor boats up to 40 feet (12 meters) in length and at least two for motor boats 40 feet (12 meters) in length or longer; and
- A minimum of one Life ring (Type IV PFD) at intervals of not more than 200 feet with at least 90 feet of line, shall be provided and readily available for emergency rescue operations from land.

Emergencies

- If requested, contractors operating watercraft on site must develop a plan which addresses response to marine emergencies such as fire, sinking, flooding, severe weather, man overboard, and hazardous materials incidents. The plan should include escape procedures and routes, employee accounting following an evacuation, rescue and medical duties, means of reporting emergencies, emergency coordinators, off-site emergency support coordination, and alarm/notification system(s).
- Each crewmember shall be given a written description of, and shall become familiar with, his/her emergency duties.
- Person overboard or rescue drills shall be conducted at boat yards, work areas adjacent to water, and other locations where marine rescue equipment is required.
- Swimming shall be prohibited for all personnel on watercraft and other marine locations, except certified divers in the performance of their duties, unless necessary to prevent injury or loss of life.
- A person in the water shall be considered as a person overboard and appropriate action taken.

Weather Conditions

- All personnel shall be aware of the forecast and keep an “eye to the sky”. Unpredicted storms may also occur without warning.
- Work will be suspended when a sustained wind of 26 knots or 30 mph is encountered or in the event of Gale force winds (34 – 47 knots or 39-54 mph).
- Use of any 12 to 16-foot Aluminum-hulled tender boat during small craft advisories or greater warnings (18 – 33 knots or 20 – 38 mphs) will not be allowed.
- If lightening is observed from any location on site, operations will cease. All equipment will be lashed to the deck or placed in the storage area and all personnel will be transported to shore. Operations will be allowed to continue 30-minutes after the last lightning is observed, unless the weather forecast shows other storms approaching.

Lifesaving Skiffs

- At least one lifesaving skiff (a powered john boat or other smaller boat used in emergencies), shall be immediately available at locations where employees are working over or adjacent to water.

- Personnel trained in launching and operating the skiff shall be readily available during working hours. Lifesaving personnel shall perform a lifesaving drill before the initiation of work at the site and periodically thereafter as specified by the SSHO.
- Skiffs shall be kept afloat or ready for instant launching.
- Required equipment must be on board and meet or exceed U.S. Coast Guard requirements. Skiffs shall be equipped as follows:
- Four oars (two if the skiff is motor powered);
- Oarlocks attached to gunwales or the oars;
- One ball-pointed boat hook;
- One lifering with at least 70 feet (21 meters) of 3/8 (1 centimeter) solid braid polypropylene line, or equivalent, attached; and
- PFD's in number equaling the skiff rating for the maximum number of personnel allowed on board.

OSHA's Definition of "Immediately Available" Life Saving Skiff

- The skiff must be in the water or capable of being launched by one person.
- There must be at least one person designated to respond to water emergencies and operate the skiff at all times when there are employees above water.
- The designated operator must either man the skiff at all times or remain in the immediate area.
- The skiff operator may be assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff.
- The communication system, such as a walkie-talkie, must be used to inform the skiff operator of an emergency.
- The skiff must be equipped with both a motor and oars secondary means of propulsion.

According to OSHA's directive relative to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:

- The number of work locations where there is a danger of falling into water;
- The distance to each of those locations;
- Water temperature;
- Currents;
- Other hazards such as, but not limited to, rapids, dams, and water intakes.
-

References

- OSHA 29 CFR 1926.106, Working Over or Near Water
- 33 CFR – Navigation and Navigable Waters

- 46 CFR – Shipping
- EM 385-1-1, Section 19, US Army Corps of Engineers Safety and Health Requirements Manual
- U.S.C.G Types of Personal Floatation Devices (PFDs) Website: http://www.uscgboating.org/safety/fed_reqs/equ_pfd2.htm
- Maine Department of Marine Resources – Distress Signals Website: http://www.state.me.us/dmr/bmp/distresssignal.htm

PIPELINE OPENING PROGRAM

The proper isolation and opening of pipelines are essential to safe work operations. This section describes the safety requirements necessary for the separation of process lines, pipelines, transfer lines, and any other permanent, fixed, flexible, or temporary piping that may be required during maintenance activities. This section is also to be used in conjunction with the chemical specific sections to ensure that spill control and cleanup is performed safely. It does not apply to hoses used in the temporary connection of trucks or pieces of equipment.

Opening a pipeline is, in essence, opening into a closed system. Regardless of the checking done and the instruments employed, it must be assumed that at the point where the line is to be broken there is liquid or gas that will escape.

Opening Procedures

The general procedure for opening pipelines is to isolate the work area using valves or other isolation devices, de-energize/depressurize the line, and perform work activities. The specific procedures follow.

- Apply Lockout/Tagout procedures to electrically deactivate and physically isolate pumps, blowers, etc;
- Isolate the portions of line to be broken from those adjoining it. Close chain and lock valves of adjoining lines to prevent inadvertent openings;
- Drain and purge the line of as much content as possible, using methods that do not require line opening (e.g., sample tap or drain);
- Provide a water hose at the point where the break is to be made. The water will be kept running or the end shall be nozzled;
- Place a drip pan or funnel under the line where the initial break will be made to collect any drainage. Use a splash shield or glove bag to direct sprays into collection pan;
- Ensure proper monitoring equipment is available in accordance with Section 5.9 and the task specific requirements;
- Don the required PPE;
- Ensure the buddy system is used;
- Carefully break the line;

- Apply a blank to the remaining portion of the line not to be worked on to minimize leakage; and
- Treat spills if present.

Precautions

When opening a line the following precautions should be followed:

- Loosen flange bolts which are farthest from the mechanic first. To prevent the sudden opening of the joint, old flange bolts should be replaced by new ones which can be gradually loosened;
- Stand aside or use shielding whenever possible to avoid any spray or release of gases. Poly sheeting placed over the flange joint while removing bolts is an excellent way to contain possible sprays; and
- Open the flange joint using a flange spreader whenever possible and practicable. When it is not possible (close quarters, size of pipe, etc.), wedges may be used; and
- Manage the material drained from the pipes.

NOTE: A chain or strong flexible wire shall be secured to the wedge, the other end firmly secured to a fixed object, to prevent the wedge from flying in the event it slips from the joint.

References

No references for this section.

ASBESTOS-CONTAINING MATERIALS CONTROL AND REMOVAL (RESERVED)

ENTERING AN UNOCCUPIED BUILDING

Precautions

The following conditions are potential hazards that may arise when entering an unoccupied building. The hazards are listed below with their corrective actions.

- When there is inadequate lighting, carry a flashlight with new/charged batteries. Wear hard hat with lamp attachment. Carry other portable lights with extension cord. Only go in building when there is ample sunlight if possible;
- To avoid slips, trips and falls, clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris. Mark, identify, or barricade other obstacles;
- When structurally deficient floors, ceilings and stairways are encountered, the use of the buddy system shall be initiated within the work area. Carry well charged cell phone. Use good visual judgment;
- When walking on wet floors, employee must wear boots with good treading and walk slowly;
- If broken glass or used hypodermic needles are encountered, employees should wear cut resistant gloves;

- To prevent bites from rodents, snakes, insects or dogs, employee should discuss potential encounters before entering building. A safe distance should be kept between employee and nests or likely animal habitats. Insect repellant should be worn by employees. The buddy system should be implemented;
- If bat, pigeon or mouse feces are encountered, employee should keep a safe distance from it. A flashlight should be used to prevent accidental contact;
- To avoid breathing problems in an area with poor air quality, a face mask should be worn with appropriate filters;
- Employee should wear face mask with appropriate filters if friable asbestos, lead paint chips or mold is apparent. Employee should also avoid contact with suspect material;
- If squatters or homeless persons are encountered, the police should be summoned and the employee should maintain a safe distance.

PROCESS SAFETY MANAGEMENT

The major objective of process safety management of highly hazardous chemicals is to prevent unwanted releases of hazardous chemicals especially into locations which could expose employees and others to serious hazards. Apex does not own or operate a process that requires compliance with the process safety management standard. Apex employees may be assigned to work in locations that are covered under the process safety management standard and may contract work to a subcontractor within the scope of work required to complete contract requirements.

Process safety management is the proactive identification, evaluation and mitigation or prevention of chemical releases that could occur as a result of failures in process, procedures, or equipment. The process safety management standard targets highly hazardous chemicals that have the potential to cause a catastrophic incident. Apex project managers will review process design, process technology, operational and maintenance activities and procedures, non-routine activities and procedures, emergency preparedness plans and procedures, and other elements which impact the process to prevent or mitigate the release of hazardous chemicals as needed within the scope of the Apex project. Apex project managers who use contractors to perform work in and around processes that involve highly hazardous chemicals, will need to establish a screening process to ensure that they hire and use contractors who accomplish the desired job tasks without compromising the safety and health of employees at a facility.

For contractors, whose safety performance on the job is not known to the hiring employer, the employer will need to obtain information on injury and illness rates and experience and should obtain contractor references. Additionally, the employer must assure that the contractor has the appropriate job skills, knowledge and certifications (such as for pressure vessel welders) and employees are trained in the work practices necessary to perform his/her job. Contractor work methods and experiences should be evaluated. Contractor employees shall abide by employers

safe work practices during operations such as lockout/tagout, confined space entry, opening process equipment or piping and controls over entrance to facility. The contract employer shall advise the employees of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work. All contract employers must respect the confidentiality of trade secret information when the process safety information is released to them. The contract employer shall assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process and the applicable provisions of the emergency action plan.

Employees must immediately report all accidents, injuries, and near misses within 24 hours. An incident investigation is a requirement of the incident report and resolutions and corrective actions must be implemented and documentation is maintained 5 years.

SUBCONTRACTOR SAFETY MANAGEMENT PLAN

Overview

Apex Companies, LLC (Apex) has established procedures to review and require that subcontractor safety programs, training, procedures and initiatives coordinate with the Company's own standards of safety.

The process is intended to help ensure that, in the event subcontractors are utilized by Apex as part of a work project, each subcontractor's safety programs, OSHA compliance, training, confirmations, documentation and statistical results of previous safety performance are in accordance with requirements of both Apex and the general contractor.

Subcontractor safety and health requirements

Pre-qualification by Apex include reviews of the subcontractor's:

- OSHA 300 log for the prior three years, or from the date the subcontractor began doing business if this time is less than three years;
- OSHA experience regarding any previous inspections or citations;
- Written safety and health programs as required by Apex and/or the respective host employer or general contractor;
- Written subcontractor procedures for at-work incident, injury, illness and emergency response, reporting and investigation requirements;
- Workers' compensation insurance EMR (Experience Modification Rating) information;
- Proof of insurance documented by a current certificate of insurance from the subcontractor's insurance agent(s);
- Documentation of required safety training of subcontractor employees that will be assigned to the respective project, including supervisor, competent person training and site safety representative training;
- Documentation of required Operator Qualification (OQ) and other individual qualifications or certifications as may be required by the project.

Review and evaluation will be performed by the Apex project manager.

Written materials, submissions, results and documentation of subcontractor pre-qualification reviews will be maintained by the project manager in a file for a period to be determined in coordination with Apex policy.

Inclusion and participation of subcontractors in project safety initiatives

Subcontractors assigned by Apex to a project will attend initial safety and planning meetings, project safety orientations, incident, injury and illness response planning and coordination meetings.

Subcontractor personnel will participate in these and other such activities as required by Apex in preparation for working safely at the project location.

Subcontractor personnel will utilize, cooperate with, attend and support all pertinent components of safety programs and procedures; safety orientation, training, tailgate and daily meetings; qualification and/or certification requirements; periodic safety meetings and awareness activities; safety inspections; incident reporting and investigation procedures; and other such safety, health and incident prevention initiatives as may be established for all workers at a project location.

Subcontractor personnel will participate in and cooperate with Job Hazard Analysis (JHA), Job Safety Analysis (JSA) and Job Safety Observations (JSO) as established for the project workplace.

Requirements for reporting hazards, incidents, injuries and illnesses

Subcontractor employees are responsible for reporting any observed near-miss, hazard or unsafe behavior of another person when there is a potential for causing an incident, chemical release, injury or illness in the project workplace.

First report will be made to the subcontractor's on-site supervisor or to the Apex project manager if the supervisor is not readily available. Reporting should be made without delay to help facilitate intervention and preventive measures.

Subcontractor supervisors will forward any such report to the Apex contact person so that additional communication can be made and/or actions taken if Apex deems this necessary.

Any on-the-job injury or illness that requires medical attention by a physician or professional medical provider will be reported immediately to the Apex contact person after the individual(s) requiring treatment are in-route to medical care.

Subcontractors will investigate their employee near-misses, first aid injuries, and incidents, injuries or illnesses in the project workplace in accordance with requirements established by Apex for the project.

Post-project reviews of subcontractor safety performance and results

On conclusion of a project, Apex will conduct a timely review of each subcontractor's safety performance, incident and injury experience, and other factors that will be helpful in evaluating the subcontractor's suitability for future Apex projects.

Post-project evaluations will be performed by the Apex project manager in coordination with Apex supervisors who worked with the subcontractor during the specific project under review.

GENERAL WASTE MANAGEMENT

Prior to starting all projects, Apex Companies, LLC (Apex) project managers must estimate the waste that will be generated prior to work being performed so that the need for containers and waste removal, if necessary, can be determined. Project managers should encourage proper segregation of waste materials to ensure opportunities for reuse or recycling.

During the project, waste materials should be properly stored and handled to minimize the potential for a spill or impact to the environment. During outdoor activities, waste receptacles must be covered to prevent dispersion of waste materials and to control the potential for run-off. If any waste generated is classified as hazardous, employees must be trained to ensure proper disposal. All hazardous materials generated during the project must be labeled appropriately and stored in designated areas.

Apex employees must be instructed on the proper disposal method for wastes. This may include general instruction on disposal of non-hazardous wastes, trash, or scrap materials. This also includes all personal protection equipment that could not be decontaminated.

Proper methods must be used to prevent any contaminated material, soils, or liquids from leaving the site from rain or weather related (wind) events. This includes covering the material or using other containment methods to prevent contamination to surrounding property. Any dispersion of material off site must be immediately reported to the project manager.

SPILL PREVENTION AND RESPONSE

Apex Companies, LLC (Apex) project managers must insure that all chemicals used on a job site are stored in proper containers to minimize the potential for a spill. Whenever possible, chemicals should be kept in closed containers and stored so they are not exposed to stormwater. Areas where chemicals may be used or stored must be maintained using good housekeeping best management practices. This includes, but is not limited to, clean and organized storage, labeling, and secondary containment where necessary.

A proper spill kit must on site and contain the appropriate supplies for materials that may be spilled. Supplies must be easily accessible when required, and considerations must be made for both the type and quantity of materials.

Apex employees must be trained on the proper response procedures for spilled materials. The training should include materials available for use, proper waste disposal, and communication procedures.

In preparation to respond to the spill, trained responders should understand what are the physical and toxicological properties of the chemical materials of the spill. In addition responders must know what the appropriate PPE is required for the response to the spill.

In an event of a spill, employees should immediately notify their project manager or the manager of health and safety. Communication procedures should be based on type and quantity of materials spilled. An incident report must be completed within 24 hours and emailed to incidents@apexcos.com.

For potentially hazardous spills, attend to injured or contaminated persons and remove them from the exposure if you can do so without endangering yourself and alert persons in the immediate area to evacuate the area if needed. If spilled material is flammable, remove heat and ignition sources.

Always prevent any material from entering a drain. Try to contain/adsorb material if possible.

11.0 TRAINING PROGRAMS

EHS training for managers, supervisors and workers is one of the fundamental elements of an effective EHS program. The type and amount of training required is dependent upon the nature of the work, the hazards encountered and the specific roles and responsibilities of the employee. Training can vary in form from formal classroom presentations to simple one-on-one exchanges between a worker and supervisor.

Each Apex employee working in potentially hazardous conditions must successfully complete required and applicable regulatory training. The purpose of such training is to educate and to reduce, as far as possible, the incidence of unnecessary or avoidable injuries, exposures to chemical or physical hazards, and to provide employees with the knowledge and means of successfully discharging their ES&H responsibilities. The responsible Project Manager will determine by job classification or job task analysis and a review of the applicable ES&H regulations the appropriate level of training to be provided to each of their subordinates.

Additionally, the Project Manager will also ensure that new employees are provided orientation training, that other subordinates receive professional development training in order to remain knowledgeable and perform their jobs safely, and that each employee's training status is tracked, maintained current and remains acceptable. It is the intent of Apex to provide every person engaged in on-site activities a level of EHS training consistent with their job functions and responsibilities.

There are several agencies and regulations governing EHS training, program review, and recordkeeping. These include the requirements specified in:

- Resource Conservation and Recovery Act (EPA);
- Hazardous Waste Operations and Emergency Response (OSHA);
- Hazard Communication Standard (OSHA);
- Respiratory Protection (OSHA);
- Personal Protective Equipment (OSHA);
- Hearing Conservation (OSHA);
- Hazardous Material Transportation (DOT/IATA);
- EHS Training/Competent Person Program (OSHA);
- Equipment Training (Various regulations); and
- Training Records (Various regulations).

RCRA

RCRA regulates the management of solid waste, underground storage tanks holding petroleum products or other certain chemicals. In addition, RCRA regulates hazardous waste from "cradle to grave." Hazardous waste is defined under RCRA by its' ignitability, corrosiveness, reactivity or the concentration of toxic chemicals.

The training requirements for Apex personnel working on hazardous waste sites governed by RCRA are:

- Classroom or on-the-job training;
- Relevant hazardous waste management procedures; and
- Emergency procedures and equipment.

Apex personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with RCRA. This training program must be directed by a person trained in hazardous waste management procedures, and must include instruction which teaches Apex personnel hazardous waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed.

At a minimum, the training program must be designed to ensure that Apex personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems, including:

- Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment;
- Key parameters for automatic waste feed cut-off systems;
- Communications or alarm systems;
- Response to fires or explosions;

- Response to ground-water contamination incidents; and
- Shutdown of operations.

Apex personnel at RCRA sites must not work in unsupervised positions until they have completed this training.

Facility personnel must take part in an annual review of the initial training required.

HAZWOPER

Field assignment personnel who have the potential to be exposed to hazardous substances, health hazards, or safety hazards must attend training which satisfies the OSHA HAZWOPER training requirements (29 CFR 1910.120/29 CFR 1926.65). Recommended topics for HAZWOPER training are included in the **HAZWOPER Training Checklist** (Form 14-1, Appendix A).

If state hazardous waste training regulations exist, this training must also fulfill the state's requirements.

Requirements for Initial Training

Under the HAZWOPER standard, workers are categorized as either general site workers or occasional site workers. General site workers are equipment operators, general laborers and supervisory personnel; engaged in hazardous substance removal or other activities that exposes or potentially exposes them to hazardous substances and health hazards. Occasional site workers are workers on site only occasionally for a specific limited task, such as but not limited to, groundwater monitoring, land surveying or geophysical surveying. They are unlikely to be exposed over permissible exposure limits and published exposure limits.

Individuals meeting the general site worker requirements will receive 40 hours of off-site instruction, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

Less stringent training is required for individuals meeting the occasional site worker requirements or for personnel who work in the areas: (1) that have been monitored and fully characterized indicating that exposures are under permissible exposure limits (PELs); (2) where respirators are not required; and (3) where the characterization indicates that there are no health hazards or the possibility of an emergency developing.

Personnel that satisfy these requirements will receive 24 hours of off-site instruction and a minimum of 1 day actual field experience under the direct supervision of a trained, experienced supervisor.

Employers who can show by an employee's work experience and/or training that the employee has had the equivalent of the stated requirements will be considered as meeting these initial training requirements.

Recommended topics for the initial HAZWOPER training are:

- Names of employees and others responsible for safety and health;
- Employee rights and responsibilities under OSHA;
- Acute and chronic effects of exposure to hazardous substances that may be present, the potential routes of exposure and symptoms of exposure for these substances, the PEL and IDLH values, and the level of personal exposure that can be anticipated;
- Air monitoring procedures, including the functions, limitations, use, and maintenance of monitoring equipment;
- Discussion of action levels for changing site PPE or evacuating the site;
- Review of the SSHP;
- Contractor Injury and Illness Prevention Programs;
- SOPs prepared specifically to address various aspects of potential project activities;
- Engineering controls, such as dust suppression techniques;
- Personal cleanliness and restrictions on eating, drinking, and smoking;
- Personal protective equipment (PPE);
- Medical surveillance program;
- Decontamination;
- Emergencies and review of emergency procedures and facilities, including bloodborne pathogens and universal precautions;
- Fire prevention measures and fire extinguisher use;
- Site control measures;
- Spill containment program for chemical handling locations ;
- Proper use of heavy equipment and machinery;
- Other physical hazards such as slip/trip/falls, noise, electrocution, being struck-by something and being caught in or between something; and,
- Heat and/or cold stress prevention, treatment and monitoring.

Supervisor/Manager Training

The on-site managers or supervisors responsible for overseeing personnel engaged in site work must have at least eight additional hours of specialized training on managing such operations.

This specialized training includes a review of Apex's EHS manual. At a minimum, the following programs and procedures must be reviewed:

- The employee training program (This section);
- The respiratory protection program;
- The personal protective equipment program;
- Hazardous waste operations and emergency response ;
- Air monitoring procedures and techniques; and
- Any additional practices and procedures to satisfy the training requirements of the HAZWOPER standard.

Refresher Training

Employees who are trained in accordance with the plan shall receive annual refresher training. A record of methods used must be kept. All workers, whether general, occasional or supervisory, will complete eight hour refresher training annually on the topics covered in the OSHA HAZWOPER 40 hour or 24 hour initial training program, indicated above.

HAZARD COMMUNICATION/WORKER RIGHT-TO-KNOW

Hazard communication (HAZCOM) training will be conducted either during HAZWOPER training, at a job site, or on an individual basis by an EHS Specialist. The training will include the following topics:

- Requirements of the HAZCOM standard (29 CFR 1910.1200);
- Operations involving hazardous chemicals;
- Location and availability of the site HAZCOM written program, chemical list, and MSDSs;
- Methods used to detect the presence or release of hazardous chemicals;
- Physical and health hazards of the chemicals; and
- Protective measures, work practices, and emergency procedures.

Additional HAZCOM training topics are found on the **Hazard Communication Checklist** (see Forms Appendix).

Any employee who works with or has the potential for hazardous chemical exposure will receive training on the Hazard Communication Standard as conducted by the designated Supervisor, or outside contract training sources as identified. This training will take place upon initial hire and on an as-needed basis thereafter.

When Apex employees are assigned work at other employer job-sites, they will receive Site Specific Orientation to that host-facility employer's HAZCOM program.

A program that uses both audio and visual materials in a classroom type setting will be utilized for training purposes. Whenever a new hazard is introduced, additional training will be provided. Regular safety meetings will also be used to review the information presented in the initial training. Supervisory personnel will be trained regarding hazards and appropriate protective measures so that they will be able to answer questions from employees and provide daily monitoring of safe work practices.

The **Hazardous Communication Training Certification Form** (see Forms Appendix) will be used to document HAZCOM training. This form must, signed and dated by the employee and the person performing the training. This documentation is maintained by the Human Resources Department, and is available upon request for review or as required during any investigation/audit.

The training program will emphasize the following:

- Summary of the OSHA Standard and this written program;
- Chemical and physical properties of hazardous materials and methods that can be used to detect the presence or release of chemicals;
- Physical hazards of chemicals (fire or explosion potentials);
- Health hazards, including signs and symptoms of exposure and any medical condition known to be aggravated by exposure to the chemical;
- Procedures to protect against hazards (PPE required, proper use and maintenance of PPE, safe work practices or methods to assure proper use and handling of chemicals, and procedures for emergency response);
- Location of MSDSs and how to read and understand this information; and
- How to read and interpret the information on warning labels and how to obtain additional information.

Retraining will be performed by Apex or outside contract training services when the hazard changes, or when a new hazard is introduced into the workplace.

RESPIRATORY PROTECTION PROGRAM TRAINING

Respiratory protection training must be included in the initial 40 hour and 8 hour HAZWOPER training. The regulations governing respiratory protection can be found in 29 CFR 1910.134.

Any Apex employee issued a respirator must be medically qualified and receive proper training prior to being fit tested, or using the respirator. The training must be comprehensive, understandable and recur annually, or more often, if necessary. The training will include the following:

- An explanation of the respirator and its parts;
- A demonstration of how to properly put on, adjust, wear and check the seal of the respirator by positive and negative pressure tests;
- An opportunity to wear the respirator in a normal environment;
- A review of the requirements of the OSHA Respiratory Protection Standard and Apex's RPP (Section 9.1);
- Qualitative fit-testing of the employee, at least annually, with the respirator he/she will use (for half or full-face piece respirators); quantitative fit-testing for all other respirator types;
- An explanation of the nature of the respiratory hazards for which protection is sought and the health effects which can occur from exposure to the contaminant(s);
- How to use a respirator effectively in emergency situations, including malfunctioning situations;
- A discussion of how improper fit, usage or maintenance can compromise the protective effect of a respirator;

- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators;
- A discussion of the respirator's protection capabilities, limitations and factors that impact proper fit;
- A discussion of Apex's EHS practices regarding the use of respirators; and,
- Instructions for proper cleaning, maintenance, storage, inspection, care, and cartridge replacement.

PERSONAL PROTECTIVE EQUIPMENT TRAINING

Personnel working in hazardous environments must be trained in the proper use of PPE. Effective training allows the user to become confident and familiar with the equipment in a non-hazardous environment while at the same time increasing awareness of the PPE's limitations. Note that training should be conducted and documented even for PPE with which the workers may already be quite familiar (e.g., hardhats, safety glasses, safety shoes, etc.). Apex employees will during initial or annual refresher HAZWOPER training.

All workers assigned PPE should be provided training both initially and on a regular basis thereafter (at least annually). Documentation of PPE training (as well as any related training) is very important and should be compiled by the EHS Specialist and maintained for the duration of the project. Apex is expected to maintain training files for its personnel.

HEARING CONSERVATION PROGRAM TRAINING

In accordance with the OSHA regulation Part 29 CFR 1910.95 - Occupational Noise Exposure and the NIOSH hearing conservation training will be conducted to protect Apex personnel and contractors from performing service or activities at sites where noise exposure levels are at or above the 8-hour time-weighted average sound level (TWA) of 85 dBA.

As described in Section 9.5 the training will be repeated annually for all employees covered by the Hearing Conservation Program. The training will cover the following elements:

- The effects of noise on hearing;
- The purposes, advantages, disadvantages, attenuation of various types of hearing protectors;
- Instructions on the selection, fitting, care, and use of hearing protectors; and
- The purpose of audiometric testing and an explanation of testing procedures and results.

FIRST AID/CPR

Designated personnel who have a valid certificate in first aid training, from the American Red Cross or equivalent shall be available at work sites to render emergency first aid. First aid kits will be available and shall consist of appropriate items which will be adequate for the environment in which they are used. For construction operations, items shall be stored in a weather proof container with individual sealed packages of each type of item. First-aid supplies

should be periodically reassessed for the demand for supplies and their inventories adjusted. For construction operations, first aid kits shall be checked before being sent out to each job and at least weekly. A communication system for contacting necessary ambulance service shall be provided for prompt transportation of any injured employees to a hospital. The location, directions to and telephone numbers of hospitals shall be available in the health and safety plan and on site at all times. The telephone numbers of the physicians, hospitals or ambulances shall be conspicuously posted. Potable water will be available at all job sites. Additionally, portable emergency eye wash stations capable of supplying a continuous flow of water for 15 minutes will be available at specific work locations where the possibility of contacting corrosive liquids or other eye splash hazards exist.

Bloodborne pathogen training will be conducted for all employees prior to initial assignment to tasks where occupational exposure may occur. The training will contain, at a minimum, the following subjects:

- Access to standard;
- General explanation of epidemiology and systems of bloodborne diseases;
- Modes of transmission of bloodborne pathogens;
- Employer's Exposure Control Plan;
- Methods of recognizing tasks that can lead to exposure;
- Use and limitations of engineering controls, work practices, and personal protective equipment;
- Information on HBV vaccine;
- Actions to take in the event of an emergency;
- Incident reporting and medical follow-up;
- Post-exposure evaluation following an incident; and
- Signs and labels and/or color coding,

Apex will provide bloodborne pathogen training on an annual basis, including updates and modifications as deemed necessary.

EHS TRAINING/COMPETENT PERSON PROGRAM

Competent / Qualified Person Requirements

Various OSHA standards and USACE requirements mandate that employers provide for frequent and regular safety inspections of the job sites, materials, and equipment to be made by the Competent / Qualified persons designated by the employers (Table 14-1).

This definition, combined with duties and responsibilities, indicate four important factors associated with Competent Persons:

- They must be designated;
- Their major role is to perform inspections;

- They must be capable of recognizing hazards; and
- They must have authority to promptly correct hazards.

It is recognized that under some of the standards, more than one person, depending on the skills and knowledge needed, may fill the Competent Person duties. Apex Environmental requires that the project manager, with the assistance of EHS Specialists, ensure that personnel assigned to the project meet the competent and qualified persons requirements. Since the qualifications of the Competent Persons are performance as opposed to specification based, it is up to the project manager to determine what the qualifications of the designated persons need to be. This will depend on the hazards and complexity of the job, and the knowledge, experience and authority of the person. The Competent Persons should also be aware of the technical requirements of the OSHA standard they are being designated under. For example, the Competent Person for excavations may need to be capable of performing soils analysis required by the rule, and of selecting slope or bench angles consistent with the soil type.

Generally, the competent person will be the project EHS Specialist, provided they have the capabilities in the given area. However, in certain cases, a craft employee may be best, as in the requirement for daily crane inspections. Generally, the project manager should use the following checklist to evaluate the qualifications of the designated Competent/Qualified Person:

- Understands duties and responsibilities;
- Has training;
- Has knowledge and skill to assume the task;
- Is familiar with standards;
- Is given authority to function on the job;
- Is provided with and reviews applicable standards and procedures; and
- Is provided with necessary equipment/materials.

When an individual has the basic knowledge and skills to do the job, but needs a higher level familiarity with OSHA standards, training can be arranged on a project basis through Apex.

APEX'S COMPETENT/QUALIFIED PERSON REQUIREMENTS

REQUIREMENT	OSHA REFERENCE	COMMENTS
Approval of PPE or other controls to maintain exposures below PELs	1910.1000(e)	Qualified Person Requirement
Buildup roofing safety monitoring system	1926.502(p)(7)	Competent Person Requirement
Crane/Derrick Inspections	1926.550 (a)(5) 1926.550 9(g)(5)(iv) 1926.550 (g)(5)(vi)	Competent Person Requirements
Cranes (2 or more used to lift the same load)	1910.179 (n)(3)(ix)	Qualified Person Requirement

REQUIREMENT	OSHA REFERENCE	COMMENTS
Cutting or welding on flammable surface	1926.354(a)	Competent Person Requirement
Employee Training for Ladders and Stairways	1926.1060	Competent Person Requirement
Examining Damaged Excavations Protection	1926.652(d)(3)	Competent Person Requirements
Excavation Competent Person Training	1926.651	Competent Person Requirement
Excavation Inspections	1926.651(h)(2)& (h)(3) 1926.651(k)	Competent Person Requirement
Excavation Competent Person Training	1926.651	Competent Person Requirement
Explosives and Blasting Agents	1910.109(c)(5)(viii) 1910.109 (d)(2)(iii)(b) 1910.109(g)(5)(vii)	Competent Person Requirement
Fall Protection	1926, Subpart M	Competent Person Requirement
Ground Fault Protection Implementation	1926.404(b)	Competent Person Requirement
Hazardous Waste Site Preliminary Evaluation	1910.120 (c)(2)	Qualified Person Requirement
Inspections During Demolition	1926.850(g)	Competent Person Requirement
Ladder Inspections	1926.1053(b)(16)	Competent Person Requirement
Mechanical Demolition	1926.805(a) 1926.859(g)	Competent Person Requirement
Personnel Platform Design	1926.550 (g)(4)(i)(A)	Qualified Person Requirement
Pre-demolition Engineering Surveys	1926.850(a)	Competent Person Requirement
Asbestos	1926.1101	Competent Person Requirement
Blasting Operations	1926.900	Competent Person Requirement
Cadmium	1926.1127	Competent Person Requirement
Ladder Inspections	1926.1053	Competent Person Requirement
Lead	1926.62	Competent Person Requirement
Rigging Inspections	1926.251	Competent Person Requirement
Scaffolding	1926.451(a)	Competent Person Requirement
Slings	1910.184(d) & (e)	Competent person designation for preuse inspections
Soil Classification for Excavations	1926.652 (a)(1)(ii) 1926.652, Appendix A	Competent Person Requirements
Structural Ramps in Excavations	1926.51 (c)(1)(i)	Competent Person Requirement
Use of Air Monitoring Equipment	1910.1044, APPB 1910.1045, APPB 1910.1047, APPB	Qualified Person Requirement

REQUIREMENT	OSHA REFERENCE	COMMENTS
	1926.55 (b)	

EQUIPMENT TRAINING

Apex management will determine whether training required for specific jobs will be conducted in a classroom or on-the-job. The degree of training provided shall be determined by the complexity of the work requirements of the individual job and the associated hazards.

Prior to job assignment, Apex shall provide training to ensure that the hazards associated with equipment operations are understood by employees, and that the knowledge and skills required for the safe application and usage of work place equipment are acquired by employees.

Equipment training might include training on new tools introduced into the worksite or tools that an employee is unfamiliar with. For example, training can be conducted on proper use of hand tools (hammers, saws), power tools (saws, drills, grinders etc), and pneumatic tools among others. Additionally, training may also be conducted on machinery operations such as forklifts and aerial lifts. Specific training guidelines may be established by OSHA for certain pieces of equipment.

TRAINING RECORDS

Documentation of training requirements is the responsibility of Apex. Documentation of worker's current training credentials will be kept in the field and/or project office and submitted to regulatory compliance personnel upon request.

RCRA Recordkeeping

Training records on current personnel must be kept until closure of the facility. Training records on former employees must be kept for at least three years from the date the employee last worked at the facility. Personnel training records may accompany personnel transferred within the same company.

The owner or operator must maintain the following documents and records at the facility:

- The job title for each position at the facility related to hazardous waste management, and the name of the employee filling each job;
- A written job description for each position. This description may be consistent in its degree of specificity with descriptions for other similar positions in the same company location or bargaining unit, but must include the requisite skill, education, or other qualifications, and duties of facility personnel assigned to each position;
- A written description of the type and amount of both introductory and continuing training that will be given to each person filling a position;

- Records that document that the training or job experience required has been given to, and completed by, Apex personnel.

Respiratory Protection Program Recordkeeping

A course roster and/or training form will be completed for each course and be made part of the permanent record. A Training Attendance Form is included in this Manual (see Forms Appendix). Training records will be kept at least as long as medical records (30 years after the last date of employment).

References

- EPA 40 CFR 265, Resource Conservation and Recovery Act
- OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
- OSHA 29 CFR 1910.1200 Hazard Communication Standard;
- OSHA 29 CFR 1910.134 Respiratory Protection
- OSHA 29 CFR 1910.132-138 Personal Protective Equipment (PPE)
- OSHA 29 CFR 1910.95 Hearing Conservation

HAZARDOUS WASTE OPERATIONS /RESOURCE CONSERVATION RECOVERY ACT AND WASTE MANAGEMENT

This Waste Management Program describes the approach for managing wastes generated during the project activities as well as any field investigations performed by Apex. The generated wastes have the possibility of containing a variety of hazardous and non-hazardous constituents.

Because of the possibility that hazardous wastes, as defined by the Resource Conservation and Recovery Act (RCRA) may be generated, all wastes must be properly characterized to ensure proper management and disposal practices. The following sections describe the approach to identifying, handling, and disposal of wastes generated during these programs.

Roles and Responsibilities

The required waste management responsibilities at the base include the following:

- Pre-transport requirements (packaging, marking, labeling, storing, and placarding of hazardous and non-hazardous wastes before shipment),
- Conducting routine waste characterizations;
- Completing waste tracking forms and waste tracking logs;
- Drum/container inspections for stored wastes;
- Waste inventories as wastes accumulate;
- Preparing transportation manifests; and
- Shipment of wastes within regulated accumulation times.

If there are any questions concerning the RCRA or DOT requirements, the hotlines for each may be contacted. The number for the RCRA hotline is 1-800-424-9346 and the number for the DOT hotline is 1-800-467-4922.

Hazardous wastes will be sent to a permitted TSD facility. Upon any changes in waste streams or procedures, this document will be updated and kept current.

Hazardous Waste Generator Status

The Federal RCRA identifies three categories for generators of hazardous waste: large quantity generators, small quantity generators, and conditionally exempt generators. Below is a list of the different generator types and the associated hazardous waste management requirements set forth by the EPA that are specific to each category.

Table 1.1

EPA HAZARDOUS WASTE GENERATOR CATEGORIES

GENERATOR STATUS	GENERATION	ACCUMULATION TIME	MAXIMUM ACCUMULATION (at any one time)	SATELLITE[1] ACCUMULATION QUANTITY LIMITS (at the point of generation)
Large Quantity	>2,200 lb./month	90 days	NA	Up to 55 gallons of hazardous waste or 1 quart of acutely hazardous waste
Small Quantity	>220 lb./month but <2,200 lb./month	180 days	13,200 lb.	Up to 55 gallons of hazardous waste, or 1 quart of acutely hazardous waste
Conditionally Exempt	<220 lb./month	NA	2,200 lb.	NA

[1]Satellite is defined as an area at or near the point of generation. NA – Not applicable.

Waste Characterization

The management of operations and maintenance (O&M) or investigation derived waste at a job site begins with the identification of the waste streams present. Identification procedures must be followed when:

- A new waste stream is introduced;
- There is a change in an operation that generates waste; or
- When updating current waste streams.

To characterize a new waste stream it must be determined whether the waste is hazardous or non-hazardous. To do this, one or more of the following may be used:

- Knowledge of the process generating the waste;
- Use of existing published or documented data on the waste or on waste generated in similar processes;
- Information obtained in material safety data sheets (MSDS); or
- Analysis of the RCRA characteristics.

When characterizing waste streams based on chemical analysis, consideration will be given to known contamination at the site or known treatment processes. This will focus the sampling on specific analyses to characterize for disposal.

Hazardous Wastes

To be a hazardous waste, a waste must first meet the definition of a solid waste. The solid waste can be identified as a hazardous waste if it exhibits certain characteristics or by being listed as a hazardous waste in the regulations (40 CFR 261). A characteristic waste can be determined by analysis for ignitability, corrosivity, reactivity and toxicity.

A waste that is not considered a characteristic waste can still be hazardous if it is a listed waste. A listed waste can fall under four categories published by the EPA in 40 CFR 261.31-33. No chemical tests are needed to determine if wastes are listed. Chemicals in the waste stream will be compared to chemicals listed. The four lists are:

- Wastes from non-specific sources (F-list);
- Wastes from specific sources (K-list);
- Certain discarded products (U-list); and
- Acutely hazardous discarded products (P-list).
- The proper method for disposal needs to be determined if waste is categorized as hazardous.

Universal Wastes

The Universal Waste Rule was implemented to streamline regulations on waste generated in small quantities by a wide range of industries. Universal Wastes are items commonly thrown away by households and small businesses. Although handlers of universal wastes can meet less stringent standards for storing, transporting and collecting these wastes, handlers must still comply with the full hazardous waste requirements for final recycling, treatment, or disposal. Universal wastes include batteries, agricultural pesticides, thermostats and lamps.

Non-Hazardous Wastes

Non-hazardous wastes are not regulated under the EPA Hazardous Waste Rule (RCRA) or the Universal Waste Rule. State environmental regulations typically govern the generation, transport and disposal of non-hazardous waste. Refer to state requirements for guidance for management of these types of wastes.

Waste Labeling

Containers used for satellite accumulation must be properly labeled (i.e. “Hazardous Waste or “Special Waste”) with the name of the waste material. In the case where a drum is pending analysis for characterization, a label stating such, along with the date and contents of the drum will be clearly filled out and placed on the drum. To ensure that the drum is compliant with regulations, labels will be filled out in accordance with DOT regulations under 49 CFR 172.

Waste Storage

Hazardous Waste Storage

Responsibilities related to accumulating hazardous waste on site include safe storage, accurate signing and labeling, prevention of accidents, and responding to emergencies in accordance with federal regulations.

Wastes may be accumulated in a satellite area located at or near the point of generation. These containers must be located away from routine traffic, floor drains, regular trash cans, and secured against any other potential releases. The total amount of hazardous waste that may be accumulated at a satellite area is 55 gallons per waste stream or one quart of acutely hazardous waste. After this amount has been reached, the waste must be transported within three days to the job site’s designated storage area, where it may be stored for a either 90 or 180 days, depending on the volume of hazardous waste generated (Table 11-1).

The location of a designated hazardous waste storage are must be determined by qualified Apex personnel. Similar to satellite accumulation locations, waste storage area must be located away from routine traffic, floor drains, regular trash cans, and secured against any other potential releases. Proximity to transportation facilities should be considered when selecting storage areas.

Hazardous waste generated from O&M and field investigations will be stored in containers such as DOT 55-gallon drums to meet EPA requirements. The requirements for containers are:

- Containers must be labeled appropriately with the date that the waste was generated;
- Containers must be made of or lined with a material that is compatible with the waste to be stored;
- Containers must remain closed during storage, except when adding or removing waste. The containers must not be handled or stored in a manner which might cause them to rupture, leak, or fail;
- Areas where containers are stored must be inspected weekly for leaks and/or deterioration;
- Containers must be kept in good condition, or else the waste must be transferred to another container; and

- Incompatible wastes must not be mixed to prevent certain hazards.

Non-Hazardous Waste Storage

Responsibilities for the storage of non-hazardous waste are similar to that of hazardous material with respect to the safe storage, accurate signing and labeling, prevention of accidents, and responding to emergencies in accordance with federal regulations. The waste will be accumulated in areas near the point of generation and all containers will be properly labeled and dated. Non-hazardous hazardous waste may be stored in containers meeting requirements stated in the above section, "Hazardous Waste Storage", but may also be stored in tanks depending on state regulatory requirements.

Waste Transportation

Apex does not transport or dispose of any regulated waste. The client is the owner of all waste generated on their site. Apex may assist the owner in the manifesting and disposal process, but will not take possession of the waste nor sign the manifest as the generator or generators agent or as a transporter of the waste.

Hazardous waste will only be shipped off site to a permitted disposal facility licensed transporter. The waste will only be transported to a facility that is authorized to handle the waste under a state program, and if applicable, under the Federal hazardous waste regulatory program. Manifests will be kept as a record of all hazardous waste transported off site. A non-hazardous waste transporter manifest/bill of lading will accompany all non-hazardous waste shipped off site.

The EPA's Uniform Hazardous Waste Manifest may be prepared by designated Apex personnel to document the transport of hazardous waste for off-site treatment, recycling, storage or disposal. The manifest is a paper document containing multiple copies of a single form. When completed, it contains information on the type and quantity of the waste being transported, instructions for handling the waste and signature lines for all parties involved in the disposal process.

The manifest is required by both DOT and EPA. Each party that handles the waste signs the manifest and retains a copy for themselves. Once the waste reaches its destination, the receiving facility returns a signed copy of the manifest to the generator, confirming that the waste has been received by the designated facility.

Designated Apex personnel will obtain the waste transporters decal number before the waste is transported. Test results, waste analysis and other determinations made will also be kept on file for a period of at least ten years from the date the waste was last sent to on-site or off site disposal.

Disposal of Hazardous and Non-Hazardous Wastes

Recordkeeping and Reporting

A hazardous waste manifest will be prepared and will accompany all hazardous waste shipped off site and a signed copy will be obtained from the designated TSDF within 30 days of shipment. Manifests will be kept as a record of all hazardous waste transported off site. A Non-hazardous Waste Manifest/Bill of Lading will accompany any shipments of non-hazardous waste off site. The operator will fill out a waste tracking form and a log will be maintained by off site Apex personnel to keep a full record of all waste generated. Also, copies of all test results, waste analysis, and other determinations made will be kept on site for a period of at least ten years from the date the waste was last sent to on-site or off site disposal. Copies of all reports filed with the EPA will also be kept for at least ten years from the date of the report. State regulatory reporting requirements could also apply. Any container of hazardous waste shipped off site must have the following information displayed in accordance with 49 CFR 172.304:

Federal Law Prohibits Improper Disposal of Hazardous Waste. If found, contact the nearest police or public safety authority, the state environmental agency, or the nearest office of the EPA.

Daily inspections during regular business days of all containers of hazardous waste, including containers at satellite accumulation areas, shall be made and recorded in a log book which shall be kept at the facility. This will help to ensure at least that no containers are rusting, bulging, or leaking, and that all hazardous waste containers are stored in a safe manner. The logbook will contain the name of the Apex personnel conducting the inspection, the time and date of the inspection, and the conclusions of each inspection. All containers with non-hazardous waste will be inspected on a weekly basis in the same manner described above. Inspections will be recorded on a field log book or using a specific waste inspection form generated by Apex personnel.

Training requirements

Equipment operators, general laborers, supervisors and management, etc., must be trained prior to being allowed to participate in or supervise field activities. The training should cover the use of personal protective equipment. The training should also cover work practices which minimize hazardous risks and safe use of engineering controls and equipment.

Health and Safety Program

The program shall be designed to identify, evaluate, control safety and health hazards and provide for emergency response. The program should detail a specific chain of command, address tasks and objectives of the operations, and address site specific procedures. The plan should address feasible engineering controls including the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment.

Engineering controls, work practices and PPE shall be used to reduce and maintain exposure limits. Air monitoring should be used to identify and quantify airborne levels of hazardous substances. The monitoring should address initial entry, periodic monitoring, possible IDLH conditions and wherever exposure may be a possibility. A decontamination procedure shall be developed, communicated to employees and implemented before any employees or equipment may enter areas on site where the potential for exposure to hazardous substances exists.

All employees leaving a contaminated area shall be appropriately decontaminated. All contaminated clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated. Decontamination procedures shall be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies. Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment. PPE and equipment shall be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness. Employees whose non-impermeable clothing becomes wetted with hazardous substances shall immediately remove the clothing. Unauthorized employees shall not remove protective clothing or equipment from change rooms. Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they shall be provided and meet the requirements of 29 CFR 1910.141.

Medical surveillance

All employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year must be provided medical surveillance at no cost the employee.

FATIGUE MANAGEMENT PROGRAM

Apex Companies, LLC (Apex) has developed this program as a systematic plan to ensure the health, safety and welfare of employees with regard to fatigue. To accomplish this task, Apex has:

- Developed a fatigue management program
- Consulted with employees and those doing the work with higher fatigue risks
- Identified fatigue hazards
- Eliminated or controlled fatigue risks when possible
- Provided information and instruction on managing fatigue risks

The purpose of this program is to provide guidance to Apex managers on how to systematically manage fatigue risks in the workplace so that you can develop a plan which will contain strategies to effectively control the risks of fatigue. It sets out a risk management approach based on consultation with the workforce.

The approach requires that managers:

- identify the hazards of fatigue;
- assess the risks of fatigue;
- implement effective risk control measures, and
- monitor and review regularly the effectiveness of the controls.

This program is not prescriptive, which means that individual managers can develop a plan that is specific to their needs. However, all plans should address each of the main areas identified in this document. The fatigue management plan should also be incorporated in the overall health and safety management plan (including contractor management arrangements).

GLOSSARY

ACTIVE WORK
Total time spent at work including overtime. This does not include time traveling to or from the work site or rest breaks during shifts.

EMPLOYEE/WORKER
Any person who works on the site, regardless of their employer. This includes contractors.

OPERATOR/EMPLOYER
Any person or organization responsible for the employment of one or more employees/workers on site.

EXTENDED WORKING HOURS
Any working hours in excess of 40 hours, including overtime

TIME NOT WORKING
Time outside of working hours. Does not include time traveling to or from the work site.

WORK SCHEDULES
The hours to be worked for each day, shift, week, month or year, as scheduled by the employer.

SHIFT
The hours between the start and finish of established scheduled hours.

CHAPTER 1 WHAT IS FATIGUE, ITS CAUSES AND WHY IS IT A PROBLEM?

WHAT IS FATIGUE?

When fatigued, physical or mental activity becomes more difficult to perform.

Fatigue can be defined as a state of impairment that can include physical and/or mental elements, associated with lower alertness and reduced performance. Signs of fatigue include tiredness even after sleep, psychological disturbances, loss of energy, and inability to concentrate. Fatigue can lead to incidents because employees/workers are not alert and are

less able to respond to changing circumstances. As well as these immediate problems, fatigue can lead to long-term health problems.

WHAT CAUSES FATIGUE?

Fatigue builds when there is not enough rest or sleep between activities.

Fatigue results from insufficient rest and sleep between activities (also from poor quality sleep). The inter-related causes of fatigue include:

- time of day that work takes place
- length of time spent at work and in work-related duties
- type and duration of a work task and the environment in which it is performed
- quantity and quality of rest obtained prior to and after a work period
- activities outside of work, such as family commitments or a second job, and
- individual factors, such as sleeping disorders.

Acute fatigue arises from long periods of wakefulness without adequate rest.

Acute fatigue is caused by immediate episodes of sleep deprivation; for example, because of long periods of wakefulness from excessively long shifts or night shifts without adequate daytime rest. Ongoing sleep disruption can lead to sleep debt and chronic sleep deprivation, placing individuals in a state of increased risk to themselves and to others. It results in:

- unpleasant muscular weariness;
- tiredness in everyday activities, and
- reduced coordination and alertness.

If sleep deprivation continues, work performance can deteriorate even further. Fatigue can result from features of the work and the workplace and from features of an employee/worker's life outside work. Levels of work-related fatigue are similar for different individuals performing the same tasks. Work related fatigue can and should be assessed and managed at an organizational level. The contribution of non work-related factors varies considerably between individuals. Non work-related fatigue is best managed at an individual level.

Work-related causes of fatigue

Work-related causes of fatigue include:

- aspects of the tasks being undertaken (greater workload within standard shifts)
- unplanned work, overtime, emergencies, breakdowns and call-outs
- features of the working environment (noise or temperature extremes) and
- commuting times.

Non work-related causes of fatigue

Non work-related causes of fatigue include:

- sleep disruption due to ill family members
- strenuous activities outside work, such as a second job
- sleep disorders
- inappropriate use of alcohol, prescription and illegal drugs, and
- stress associated with financial difficulties or domestic responsibilities.

WHY IS FATIGUE A PROBLEM?

Fatigue increases the risk of incidents and long-term health problems.

Fatigue causes an increased risk of incidents because of tiredness and lack of alertness. When employees/workers are fatigued they are more likely to exercise poor judgment and have a slower reaction to signals. This can increase all risks on site because fatigued employees/workers are less able to respond effectively to changing circumstances, leading to an increased likelihood of incidents due to human error.

Fatigue can also result in long- term health problems, such as:

- digestive problems
- heart disease
- stress
- harmful drug and alcohol use
- mental illness.

CHAPTER 2 RISK ASSESSMENT. WHO NEEDS A FATIGUE MANAGEMENT PLAN?

All managers should conduct a fatigue risk assessment for the following operations that include working time arrangements that:

- involve more than 50 hours in any consecutive five-day period or
- more than 60 hours in any consecutive seven-day period or
- does not have a minimum of one day off in any seven-day period or
- involves commutes greater than one hour following twelve hours active work or
- involves job/shift rotation.

Commuting times should also be considered.

FATIGUE RISK FACTORS

Consideration of these risk factors will control fatigue, allow for sufficient sleep and increase mental fitness in an effort to enhance worker safety.

Sustained physical or mental effort.

- Is the work physically demanding?
- Is there time pressure due to heavy workload?
- Is the work fast paced?
- Is the work intensive?
- Have employees been consulted regarding work task and how to carry them out?

Complex physical or mental task

- Is high vigilance and/or concentration required?
- Are there different demands that can be difficult to combine?
- Are complex, difficult or strenuous tasks required at the end of shifts?

Long hours because of emergency response requirements

- Are there irregular and unplanned schedules?
- Do emergencies require long commutes?

Work environment conditions

Stress:

- Are there poor social relations at work (bullying/conflict)?
- Is there low support from peers and supervisors at work?
- Is there low recognition for the effort involved in the work?

Adverse working conditions:

- Heat?
- Cold?
- Noise?
- Dust?
- Hazardous substances?

Social Impacts:

- Family commitments?
- Insufficient sleep?
- Second job/social commitments?

CHAPTER 3 DEVELOPING AND IMPLEMENTING A FATIGUE MANAGEMENT PROGRAM.

FATIGUE MANAGEMENT PROGRAM

This program is designed to help managers develop a comprehensive fatigue management plan that is specific to their work. It proposes a suggested structure and approach; however, each plan can be expected to be different because it must take into account the specific hazards, risks and tasks for the situation. An implementation and management program should be developed through a consultative process. The developed program should be clearly documented, readily available for use and inspection by all relevant persons, and reviewed on a regular basis. It should also be integrated into the overall site health and safety plans and

contractor management arrangements.

How to develop and implement a fatigue management program.

This chapter considers the approach that managers should use to develop and implement the fatigue management program in the workplace and integrate it with health and safety plans and contractor management arrangements.

Program commitment and consultation.

Management will make a firm policy commitment to the effective management of fatigue risks in the workplace and establishing a consultation procedure. Consultation is central to the development and implementation of an effective program.

Fatigue mitigation policies and procedures that can be implemented to decrease worker fatigue include:

Ergonomic equipment to improve work conditions. These include lift assist devices, proper lighting, temperature control, anti-vibration gloves and anti-fatigue mats.

Establish periodic rest breaks. Rest breaks should be designed to allow employees to sit while resting.

ROLES AND RESPONSIBILITIES IDENTIFIED.

Managers:

- making a firm policy commitment to effective fatigue management;
- early and on-going consultation;
- establishment of roles and responsibilities;
- risk identification, assessment, control and evaluation;
- documentation of the plan;
- implementation of the plan;
- conduct periodic work task analysis and evaluations , and
- regular review and resultant modification of the plan.

Appropriate resources are essential, including competent people

Managers must ensure that appropriate resources are made available. These resources include competent people to conduct the risk management process and enforce the safe system of work agreed through the consultation process.

Employees:

- Identify risk and take active part in the evaluation process
- Comply with all recommendations of the program
- Assist in the review and resultant modification of the program
- Notify management of any changes which affect the program
- Employees must not put themselves at risk of being dangerously fatigued

- Employees must not chronically use over the counter or prescription drugs which may affect the employee's ability to perform their work safely.

Employees/workers are responsible for ensuring that their behavior does not create or exacerbate risks. They should ensure that they use the opportunities provided to obtain sleep, report occasions when adequate rest is not obtained and do their best to remain fit for work.

THE PROGRAM

The program should demonstrate management's commitment to effectively controlling fatigue risks

Consult with employees most likely to be at risk.

As with any important aspect of health and safety connected to work, appropriate policies and procedures concerning fatigue must be developed in consultation with employees/workers, as they are likely to have the best practical understanding of work processes and the potential for exposure to various hazards as a result of the work processes. In addition, employees/workers are the persons most likely to be at risk of developing ill health as a result of work-related exposures.

Consultation must be undertaken when:

- assessments are made of risks to health and safety;
- decisions are made on measures to control or eliminate those risks; and
- changes are made to methods of work that may affect health, safety or welfare at work.

The process should be flexible enough to deal with different views.

Fatigue has a direct impact on the work/life balance of all who work in the industry. Hours of work and fatigue have an effect on the individual at work and off site. Sensitivity to the communication and consultation needs of those who work nights and weekends may require special attention in communication strategies. Special attention may also be required for inexperienced employees and for contractors and their employees.

Risk management is a four-step process.

Hazard identification involves identifying the activities that may pose a risk.

Risk assessment is the process of evaluating the extent of the risk arising from exposure to the hazard.

Risk control is the process of addressing the risk by eliminating or minimizing its effect.

Evaluation is the process of checking the extent to which the control measures have been successful.

Hazard Identification

Identifying common factors that contribute to fatigue:

- Mental and physical demands of work
- Work scheduling and planning
- Work environment conditions
- Excessive commuting
- Individual and non-work factors
- Effect of exposure for longer periods

Appendix A is a fatigue management risk assessment spreadsheet.

Risk Assessment

Assessing risks helps set priorities. Risk assessment is a dynamic process, with risks being assessed and prioritized and the new work environment evaluated regularly.

Risk assessments must be done by people who are trained and competent for the task.

Risk assessment must involve appropriate consultation between all relevant parties. In particular, it is important that the employees potentially affected by fatigue hazards have an opportunity to provide input to the risk assessment process. The employee's practical knowledge of the tasks and associated hazards and risks provides an extremely valuable input into the risk assessment process.

When taking a risk management approach to fatigue, it is very important to look at how fatigue, and long working hours in general, can interact with other workplace hazards. Exposure to some hazards can be increased when working extended hours – eg manual tasks and exposure to hazardous chemicals, dust

and noise.

Risk assessments consider two aspects - likelihood and severity.

One of the keys to effective risk management is to properly assess the risks arising from a hazard. Assessing hazards related to fatigue means looking carefully at the identified fatigue risk factors to decide whether they have been eliminated or adequately controlled. The risk assessment has two aspects – assessing how likely it is that the exposure will occur, and assessing the severity of the outcome that can be expected as a result of the exposure. This dual assessment allows control activities and monitoring to be prioritized. Priority should be given to risk factors likely to result in significant fatigue, even if they are relatively rare, and to common risk factors that can be easily controlled. The results of the risk assessment should be clearly recorded.

Risk Control

Risks that arise from hazards must be controlled according to the 'hierarchy of control'.

An important concept in developing this control is the so-called "Hierarchy of Control". This hierarchy provides a set of approaches and principles, including systems of work that can be used to control hazards. Approaches at the top of the hierarchy should be considered before those further down the list. There are many forms of the hierarchy, but essentially the control measures, in descending order of preference, are as follows:

- elimination
- substitution
- isolation
- engineering
- administrative approaches, and
- personal protection equipment.

Examples of hierarchy of control for fatigue risks

Examples of the use of the hierarchy for control of fatigue risks include:

- Eliminate: eliminating any requirement for commuting after twelve hour shifts.
- Substitute: increasing the length of breaks in a shift.
- Engineering: improving ventilation and heating/cooling to improve alertness and ensure exposure to hazardous substances is reduced during extended shifts.
- Administrative: using a checklist to help supervisors identify and assess fatigue impairment.
- PPE: ensuring appropriate equipment is used. For example, standard hearing protection devices may not provide sufficient attenuation over a 12-hour shift as opposed to an 8 hour shift.

Note: Isolation has not been included in these examples because it is not directly applicable to fatigue risk.

Appendix B is a list of possible control measures for various fatigue factors spreadsheet.

Evaluation

Risk controls must be regularly evaluated

As part of the risk management process, it is important that the control of risk factors be evaluated on a regular basis. This risk evaluation forms part of the overall monitoring and evaluation of the fatigue management plan.

Finally, the plan must be able to be audited and assessed by the appropriate manager.

CHAPTER 4 DOCUMENTATION OF THE PROGRAM

FATIGUE MANAGEMENT PROGRAM DOCUMENTATION

The plan should be integrated into the site health and safety plan.

A fatigue management plan should be integrated as part of an overall health and safety plan. The plan should be:

- specific to the site;
- developed through consultation;
- available to employees;
- communicated regularly and appropriately, and
- reviewed to take account of changes in site needs and knowledge about the risks.

The program should be fully documented

The fatigue management program should be fully documented. The documentation should include:

- a commitment to managing fatigue;
- a statement of the principles for managing fatigue;
- roles and responsibilities for specific to the site;
- the risk assessments that have been undertaken;
- the risk controls that are and will be in place;
- a description of how actual hours of work will be monitored and reviewed;
- implementation strategy;
- employee training programs, both initial and refresher (minimum of annually), and
- the approach to monitoring and reviewing the plan.

CHAPTER 5 SUMMARY OF KEY PROGRAM KEY ELEMENTS

FATIGUE MANAGEMENT PROGRAM KEY ELEMENTS

Risk controls must be put in place.

The fatigue management plan must be properly implemented. Without adequate risk controls being put in place, the work that has gone into preparing the fatigue management plan will not be useful. Key issues to consider when implementing the plan include timeframes, training, roles and responsibilities, communication and participation.

Action must be implemented in a timely manner.

Establishing and keeping to the agreed timeframes is very important to ensure that adequate control measures are in place as soon as possible. The workforce will also become less supportive if they cannot see the agreed actions being done. Actions should be monitored regularly to make sure that the agreed timeframes are being met.

Training gives people the knowledge and skills to implement risk controls

Many of the new risk control measures will involve training. Training is not a suitable control measure in itself, but training is essential to good risk control. Training gives the workforce the skills and knowledge they need to work with risk controls for fatigue. It also provides appropriate information about the fatigue hazards and risks in the workplace. All site personnel, including contractors, must be informed about the fatigue management program and have the skills and knowledge they need to fulfill their roles and responsibilities.

In addition, employers must provide education and awareness about the site's fatigue policy and procedures whenever:

- new employees are added to the work site;
- refresher training is needed, at a minimum annually;
- subcontractors are present (as part of the contractor management plan);
- new managers or supervisors are promoted, and
- changes are made to the fatigue management program.

The education and awareness training should include coverage of issues such as:

- the nature of fatigue
- the warning signals of fatigue
- possible effects of fatigue
- factors that decrease or exacerbate the likelihood or effects of fatigue, and
- control measures, including the fatigue management program.

Training must be available to all employees.

The workforce plus contractors must be informed of the fatigue management program

The entire workforce, including contractors, needs to know about the fatigue management program. As with any important workplace communication, when communicating the requirements of the plan, the different needs of various groups on the site should be taken into account. These needs include that some employees may not be able to read English very well and some employees may have difficulties attending information meetings because they work away from a central workplace. As a result, different communication methods may be needed for different groups.

Adequate supervision is required

Supervisors need to be able to identify when fatigue is a problem so that they can initiate immediate control measures and report problems that need to be addressed. Supervisors will take appropriate action to assist workers and prevent incidents.

Reporting fatigue should be encouraged, not criticized

It is essential that employees (including contractors) are able to report fatigue problems affecting themselves or others without attracting criticism. This will require understanding and support from supervisors and colleagues. Reporting is more likely in a working environment where fatigue is recognized by all levels of the organization as being an important health and safety issue that should be properly managed.

The plan should be regularly audited and reviewed to make sure it is still relevant

All aspects of the fatigue management plan should be audited and reviewed at regular intervals to ensure continuing suitability, adequacy and effectiveness of the controls for eliminating risk. The plan must be reviewed when circumstances change at the site, or when there is any indication that fatigue risks are not being controlled. The hours worked by all employees, including professional staff and management, should also be monitored and evaluated as part of the fatigue management plan. Incident investigation tools must be able to identify the contribution that fatigue may make to incidents.

Specific review factors must be considered

Specific factors to consider include:

- have control measures been implemented as planned?
- are they working?
- are there any new problems? and
- incidents, near misses, injuries and other data, such as absenteeism and staff turnover rates.

Further review of control measures should be undertaken when methods, tasks, equipment, hazards, operations, procedures, rosters or schedules are introduced or the environment changes or there is any indication risks are not being controlled.

APPENDIX A

Fatigue Management Risk Assessment

Appendix A

Fatigue Management Risk Assessment

Fatigue is a state of impairment that can include physical and/or mental elements associated with lower alertness and reduced performance. Fatigue contributes to accidents.

Any single yes to the risk factors listed below requires the project manager to evaluate the need for implementation of effective risk control measures after consultation with the employee.

RISK FACTORS	YES	NO
Physical		
Work physically demanding	☐	☐
Time pressure	☐	☐
Fast paced work	☐	☐
Mental		
High concentration needed	☐	☐
Repetitive or monotonous	☐	☐
Difficult to combine demands	☐	☐
Scheduling		
Greater than 12 hours per day	☐	☐
Greater than 60 hours per week	☐	☐
Greater than 6 straight days	☐	☐
Less than 8 hours rest time	☐	☐
Environmental conditions		
Heat	☐	☐
Cold	☐	☐
Noise	☐	☐
Dust	☐	☐
Hazardous materials	☐	☐
Excessive commuting required		
Greater than 2 hours to work site	☐	☐
Greater than 1 hour after 12 hour shift	☐	☐
Stress		
Poor social relations (bullying)	☐	☐
Low recognition for effort involved	☐	☐
Low social support (peers & supervisor)	☐	☐
Non-work factors		
Family commitments	☐	☐
Insufficient quality sleep	☐	☐
Psychological issues	☐	☐
Alcohol and/or drug use	☐	☐
Second or non-paid work	☐	☐
Medical conditions		
Prescription medicine	☐	☐
Poor physical condition	☐	☐
Sleeping disorders	☐	☐

APPENDIX B

Possible Control Measures For Various Fatigue Factors

Appendix B

Control Measures For Various Fatigue Risk Factors

Risk Factor	Control Measures To Consider
Sustained physical or mental effort	Encourage adequate breaks Supply additional resources Rotate jobs Supply equipment to reduce physical demands Schedule to decrease demands near end of shift
Repetitive or monotonous work	Re-design jobs Rotate jobs
Long hours in single shift *Includes travel time to remote sites*	Supply additional resources Provide alternative transport at shift end Provide for overnight accommodations
Long hours emergency/on-call	Supply additional resources Provide for overnight accommodations Swap on-call/emergency duty Provide more and/or longer break periods
Adverse physical conditions	Avoid extreme temperature with shift changes Provide effective clothing and equipment Provide break areas (warm/cooler) Ensure well lit, safe, secure workplace
Excessive commuting times	Start day after arrival Provide transport
Individual and non-work factors	Provide employee assistance program Indentify non-work related factors Provide education about risk of fatigue Encourage employees to report non-work factors Avoid excessive alcohol
Noise, chemicals, dust	Use engineering controls to reduce noise Substitute chemicals Use dust suppression methods Use appropriate PPE Monitor exposure levels and adjust for shift time
Medical conditions	Ask doctor if alternative medication available Inform employer of any condition that may limit to work Seek advice from doctor on limitations Keep weight in check

Appendix B

Safety and Analysis Plan

1.0 Introduction

This appendix presents the field and sampling procedures and the analytical testing program that will be used to complete the field and analytical work for this project. Quality assurance and quality control (QA/QC) procedures are also discussed in this appendix.

2.0 Field and Sampling Procedures

The scope of work for the Site includes two annual groundwater monitoring events. The field and sampling procedures include the following:

- Preparatory activities;
- Well headspace measurements with a photoionization detector (PID);
- Groundwater elevation measurements;
- Collection of groundwater samples;
- Sample management (i.e., containers, storage, and shipment);
- Decontamination procedures; and
- Handling of investigation-derived waste (IDW).

2.1 Preparatory Activities

Site Health and Safety Plan. A Site-specific health and safety plan (HASP) has been prepared for the proposed activities. Appendix A of the Work Plan includes a copy of the HASP. The HASP was prepared in general accordance with the Occupational Safety and Health Act (OSHA) and the Oregon Administrative Rules (OAR). A copy of the HASP will be maintained on site during the field activities.

Property Access. PWPO will be contacted a minimum of one week prior to each field event. Prior to entering the site, field staff will also check in at the PWPO main office. The main office is located at 22125 Rock Creek Road, with the primary entrance located off Highway 18B.

Residential Notifications. Two monitoring wells (MW-9S and MW-11S) and one residential water well (RW-01) are located off site as shown on Figure 2. The owners of these properties will be notified via telephone a minimum of one week prior to sampling. If the property owners cannot be reached in advance, they will be contacted, in-person, at the beginning of the monitoring event. Contact information for the residents is provided in the EPA Work Plan (EPA, 2010) and on Table 1.

2.2 PID Headspace Measurements

Prior to sampling, the headspace around each well will be screened for organic vapors using a photoionization detector (PID). Headspace concentrations will be documented in the field notes and any volatiles will be allowed to dissipate before sampling.

2.3 Groundwater Elevation Measurements

Water level measurements will be collected in general accordance with Ash Creek's Standard Operating Procedure (SOP) 2.16 for water level measurement procedures, provided in this appendix. The referenced SOP is in agreement with water level measurement procedures outlined in the EPA Work Plan (EPA, 2010). Water level measurements will be collected from site wells at the beginning of the monitoring event. Well covers and well caps will be opened and the water level will be allowed to equilibrate under atmospheric conditions for at least five minutes before water level measurements are taken. Water level measurements will be recorded in the field notes.

2.4 Collection of Groundwater Samples

Ash Creek will collect groundwater samples from site monitoring wells and off-site water wells annually in accordance with low-flow sampling techniques described in SOP 2.5, included in this appendix. The referenced SOP is in agreement with groundwater sampling procedures outlined in the EPA Work Plan (EPA, 2010). Groundwater samples will be collected using dedicated tubing and a peristaltic pump. A minimum of three casing volumes will be purged prior to sampling. During purging, field parameters will be collected using a flow-through-cell after each purge volume. Purging will be considered complete when water quality parameters including pH, electrical conductivity, and temperature stabilize within 10 percent of the previous measurement and turbidity readings are less than 5 to 15 nephelometric turbidity units (NTU). Sample containers will be provided by the laboratory ready for sample collection.

When sampling the residential well, the tap will be opened and allowed to run for approximately 10 minutes to clear the system (including a pressure equalizing tank, if present) of residual water in the piping. Following the system purge, a sample will be collected from the tap for measurement of field parameters. The tap will be allowed to run for another three minutes before collecting another sample for the measurement of field parameters (pH, electrical conductivity, temperature). This procedure will be repeated until field parameters stabilized to within 10 percent of the previous measurements for three successive measurements. Following completion of "purging" procedures as described above, the groundwater sample will be collected directly from the tap. Sample containers will be provided by the laboratory ready for sample collection.

2.5 Sample Management

Containers. Clean sample containers will be provided by the analytical laboratory ready for sample collection (the container requirements are listed in Table B-1).

Labeling Requirements. A sample label will be affixed to each sample container before sample collection. All containers will be marked with the project name, sample I.D. (unique I.D. for each sample location), date and time stamp (military time) of collection, sampler's initials, and the type of analysis.

Sample Storage and Shipment. Soil samples will be stored in a cooler chilled with ice or blue ice to 4 degrees Celsius (°C). The cooler lid will be sealed with chain-of-custody seals. If necessary, the samples will be sent via overnight courier to the analytical laboratory for chemical analysis. Otherwise, Ash Creek will transport the containers to the laboratory. Chain of custody will be maintained and documented at all times.

2.6 Decontamination Procedures

Personnel Decontamination. Personnel decontamination procedures depend on the level of protection specified for a given activity. The HASP (Appendix A) identifies the appropriate level of protection for the type of work and expected field conditions associated with this project. In general, clothing and other protective equipment can be removed from the investigation area. Field personnel should thoroughly wash their hands and faces at the end of each day and before taking any work breaks.

Sampling Equipment Decontamination. To prevent cross-contamination between sampling events, clean, dedicated sampling equipment (e.g., groundwater sampling tubing) will be used for each sampling event and will be discarded after use. Cleaning of non-disposable items (i.e., field meter and water level probe) will consist of washing in a detergent (Alconox®) solution, rinsing with tap water, followed by a de-ionized (DI) water rinse. Decontamination water will be collected and handled in accordance with Section 2.9.

2.7 Handling of Investigation-Derived Waste

IDW will consist of purge water and decontamination water. IDW will be temporarily placed in five-gallon buckets and covered with a lid. Throughout the sampling event, the buckets will be emptied into the facility drain located at the southeast corner of the site for treatment at the on-site stormwater treatment system (Figure 2 of Work Plan). At a minimum, buckets will be emptied into the drain by the end of each field day.

Disposable items, such as sample tubing, gloves, protective overalls (e.g., Tyvek®), paper towels, etc., will be placed in plastic bags after use and deposited in trash receptacles for disposal.

3.0 Analytical Testing Program

Analytical laboratory QA/QC procedures are discussed in Section 5 of this appendix.

Table B-2 lists the proposed analytical methods, detection limit goals, and lists the anticipated number of groundwater samples. Samples will be collected and handled using methods described in Section 2 of this appendix. Specific container and storage requirements for samples will be discussed with the analytical laboratory prior to sample collection and will be in accordance with the container requirements presented in Table B-2.

The contaminant of concern (COC) for this project is pentachlorophenol; groundwater samples will be analyzed for pentachlorophenol by EPA Method 8270 SIM.

4.0 Field Quality Assurance Program

Field Chain-of-Custody. A chain-of-custody form will used to record possession of a sample and to document analyses requested. Each time the sample bottles or samples are transferred between individuals, both the sender and receiver sign and date the chain-of-custody form. When a sample shipment is transported to the laboratory, a copy of the chain-of-custody form is included in the transport container (e.g., ice chest).

Field Duplicate Samples. Two field duplicate groundwater samples will be collected during each annual sampling event. Field duplicates will consist of two samples collected sequentially from one sample location to assess data variability. The field duplicates will be analyzed by the same analytical methods used for primary samples. Relative percent differences (RPDs) for field duplicates will be calculated to assess the data precision and accuracy and potential variability caused by sample handling.

Trip Blank. Trip blanks will not be necessary for this investigation as samples will not be analyzed for volatile constituents.

Field Blanks and Equipment Rinse Blanks. Field blanks and equipment rinse blanks are not necessary because the sample tubing is dedicated to each well.

5.0 Quality Assurance and Quality Control

Laboratory QA/QC. The laboratory maintains an internal quality assurance program as documented in its laboratory quality assurance manual. The laboratory uses a combination of data quality indicators, including laboratory-specific detection limits, instrument calibration, calibration verification, blanks, surrogate recoveries, duplicates, matrix spike (MS) recoveries, matrix spike duplicate (MSD) recoveries, blank spike recoveries, and blank spike duplicate recoveries, to evaluate the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of

the test methods. QA/QC requirements are also detailed in the EPA Work Plan (EPA, 2010). Parameters for determining sensitivity, accuracy, and precision for pentachlorophenol are provided in the EPA Work Plan (Table 4, EPA, 2010).

Field QA/QC. Field duplicates and MS/MSD samples will be submitted to the laboratory as part of the field QA/QC program. The sample, sample duplicate, and the MS/MSD samples will be taken from the same sample location, if possible. A summary of QC samples are provided in Table B-3.

Instrument Calibration. Field instruments, including the water level probe and PID, will be calibrated daily prior to use. PID calibration procedures are summarized in SOP 2.1, provided in this appendix. Instruments will otherwise be calibrated in accordance with the manufacturer's specifications. Additional instructions for field equipment inspection, maintenance, and decontamination are provided in Section 3.0 of the EPA Work Plan (EPA, 2010).

6.0 Documentation

During groundwater monitoring activities at the site, field activities will be documented in the field notebook or on field data sheets. The following information will be documented in the field notebook:

- Daily time of arrival and departure from site
- Project personnel on site
- Equipment calibration records
- Health and safety monitoring records
- Summary of equipment present and equipment used
- Documentation of site visitors, their associations, and purpose of visit

The following information will be recorded on the field data sheets:

- Instrument calibration data
- Water levels
- Purge volumes
- Field measurements
- Sampling information
- IDW volumes
- Shipping information

Table B-1 - Analytical Methods - Sample Container and Preservation Requirements
Former Taylor Lumber Project, DEQ Task Order No. 20-13-04
Sheridan, Oregon

Groundwater Analysis	Method	Container	Preservative	Storage Temperature	Holding Time
Pentachlorophenol	EPA 8270 SIM	(2) 1-L Amber Glass per Sample	N/A	4°C	7 days

Notes:
1. EPA = U.S. Environmental Protection Agency.
2. °C = Degrees Celsius.
3. L = Liter.
4. N/A = not applicable.
5. SIM = Low level analysis.

Table B-2 - Analytical Methods, Anticipated Sample Number, and Reporting Limit Goals
Former Taylor Lumber Project, DEQ Task Order No. 20-13-04
Sheridan, Oregon

Analyte	Analytical Method	Anticipated Number of Samples (per event)	Reporting Limit Goal (µg/L)
Pentalchlorophenol	EPA 8270 SIM*	19	1

Notes:

1. µg/L = Micrograms per liter.
2. EPA = U.S. Environmental Protection Agency.
3. Chain-of-Custody should denote analysis as "SV8270 Acid(PCP Low Level Only)"

Table B-3 - Summary of Quality Control Samples
Former Taylor Lumber Project, DEQ Task Order No. 20-13-04
Sheridan, Oregon

Parameter	Method	Field Duplicates	MS/MSD	Field Blanks	Equipment Blanks	Trip Blanks
Pentachlorophenol *	EPA 8270 SIM	2	1/1	0	0	0

Notes:

1. EPA = Environmental Protection Agency
2. MS/MSD = Matrix Spike/Matrix Spike Duplicate.
3. * = Where possible, a sample, sample duplicate, and MS/MSD sample should be taken from the same location.
4. For MS/MSD samples, one 1-L Amber bottle is required. If sufficient volume is available, collect 2 1-L amber bottles to ensure against potential breakage.
5. For field duplicates, sample volume collected should be doubled (4-1 L Ambers per duplicate well).

Appendix C

Laboratory Analytical Report, Data Quality Review, and Oregon Laboratory Certification

This appendix documents the results of a quality assurance/quality control (QA/QC) review of the analytical data for samples collected in April 2017 for the Oregon Department of Environmental Quality (DEQ) at the Taylor Lumber and Treating Superfund site. Groundwater samples were analyzed by ESC Lab Sciences (ESC) of Mt Juliet, Tennessee. A copy of the analytical laboratory report is included in this appendix.

Report	Report Date	Sampling Event
L901583	April 17, 2017	Groundwater Monitoring

1.0 Analytical Methods

Groundwater samples were analyzed for pentachlorophenol (PCP) by EPA Method 8270 D (Low Level, PCP only).

2.0 Quality Assurance Review

The QA review included examination and validation of the laboratory data packages for the following:

- Analytical preparation and quantitation methods;
- Analytical method holding times;
- Sample handling;
- Chain of custody handling;
- Detection and reporting limits;
- Method blank detections;
- Laboratory control samples, matrix spikes and surrogates to assess laboratory accuracy;
- Laboratory control sample duplicates and matrix spike duplicates assess laboratory precision; and
- Field duplicates to assess sampling and laboratory precision.

The QA/QC review did not include a review of raw data. Based on this review, data are of acceptable quality and are suitable for their intended purposes.

2.1 Data Qualifiers

Any data that is found to have possible bias or error was qualified and flagged. The following are flags with definitions used in this QA/QC review and data tables.

J	Detected value was below the lowest calibration point for the analysis; therefore, results are estimated.
D	The relative percent difference (RPD) between the field sample and the field duplicate exceeds the control limit of 30%.

2.2 Holding Times and Sample Receipt

Samples were analyzed within the holding times specified. Samples were received on ice below 4ºC by the analytical laboratory. Sampling containers arrived intact and unbroken to the laboratory. The chain of custody was properly relinquished by the Apex Companies sampler and received by the laboratory.

2.3 Method Blanks

A method – or laboratory – blank is a sample prepared in the laboratory along with the actual samples and analyzed for the same parameters at the same time. It is used to assess if detected contaminants may be the result of contamination of the samples in the laboratory. PCP was not detected in the laboratory method blanks.

2.4 Surrogate Recovery

Surrogates are organic compounds that are similar in chemical composition to the analytes of interest and spiked into environmental and batch QC samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference on a sample-specific basis. Surrogate recoveries associated with PCP analysis were within control limits.

2.5 Laboratory Control Sample and Laboratory Control Sample Duplicate

LCS/LCSD samples are analyzed by the laboratory to assess the accuracy of the analytical equipment. An LCS/LCSD sample is prepared from an analyte-free matrix that is then spiked with known levels of the constituents of interest (i.e., a standard). The concentrations are measured and the results are compared to the known spiked levels. This comparison is expressed as percent recovery. The RPD between the LCS and LCSD is calculated. The percent recovery and RPD for the LCS and LCSD samples were within control limits.

2.6 Matrix Spike and Matrix Spike Duplicate Analyses

MS/MSD analysis involves two aliquots of an environmental sample that are spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. These analyses are used to assess the potential for matrix interference with recovery or detection of the constituents of interest and the accuracy of the determination. The RPD between the MS and MSD is calculated. An MS/MSD sample was collected from monitoring well MW-16s in accordance with the work plan, which indicated that the sample, sample duplicate, and MS/MSD samples all be collected from the same sample location. The percent recovery and RPD for the MS and MSD samples were within control limits.

2.7 Field Duplicate

A field duplicate is a second field sample collected from a selected sample location. Field duplicate samples serve as a check on laboratory quality as well as potential variability of the sample matrix. The field duplicate is analyzed and compared to the first sample to assess the precision of the analytical method. This comparison can be expressed by the RPD between the original and duplicate samples. The field duplicate samples were collected from wells MW-16S and MW-25S. The RPD for MW-16S and the associated field duplicate sample was below 30 percent and therefore within quality control limits. The RPD for MW-25S and the associated field duplicate sample was above the 30 percent limit. The error in precision can be attributed to matrix interferences since PCP is reactive and difficult to resolve on instrumentation. Results for the primary and duplicate sample for MW-25S are D-flagged in the data table as estimated values.

2.8 Reporting Limits

Reporting limits, reported as reported detection limit (RDL) on the laboratory report, were not elevated in the project groundwater samples.

2.9 Conclusion

The results of the data quality review indicate that the data are acceptable for their intended use.

ANALYTICAL REPORT

April 17, 2017

Oregon Dept. of Env. Quality - ODEQ

Sample Delivery Group:	L901583
Samples Received:	04/08/2017
Project Number:	1843-00
Description:	Taylor Lumber
Report To:	Norm Read 3150 NW 229th St., Suite 150 Hillsboro, OR 97124

Entire Report Reviewed By:

Brian Ford

Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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RW-01 L901583-01 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/04/17 14:05	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/13/17 08:54	KMP

MW-9S L901583-02 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/04/17 15:57	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 23:45	KMP

PZ-105 L901583-03 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/04/17 16:54	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 23:21	KMP

MW-10S L901583-04 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/05/17 08:42	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 22:58	KMP

MW-24S L901583-05 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/05/17 09:35	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 22:35	KMP

MW-15S L901583-06 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/05/17 10:48	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 22:11	KMP

MW-103S L901583-07 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/05/17 12:03	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 21:48	KMP

MW-20S L901583-08 GW

Collected by	Collected date/time	Received date/time
KK / CC	04/05/17 12:57	04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 21:24	KMP

MW-19S L901583-09 GW

Collected by KK / CC | Collected date/time 04/05/17 13:56 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 21:01	KMP

PZ-101 L901583-10 GW

Collected by KK / CC | Collected date/time 04/05/17 15:26 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 20:38	KMP

PZ-102 L901583-11 GW

Collected by KK / CC | Collected date/time 04/05/17 16:32 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 20:14	KMP

MW-12S L901583-12 GW

Collected by KK / CC | Collected date/time 04/06/17 10:00 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 19:51	KMP

MW-6S L901583-13 GW

Collected by KK / CC | Collected date/time 04/06/17 10:45 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 19:27	KMP

MW-6D L901583-14 GW

Collected by KK / CC | Collected date/time 04/06/17 11:10 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 19:04	KMP

MW-13S L901583-15 GW

Collected by KK / CC | Collected date/time 04/06/17 12:15 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 18:40	KMP

MW-16S L901583-16 GW

Collected by KK / CC | Collected date/time 04/06/17 13:10 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 17:30	KMP

MW-11S L901583-17 GW

Collected by KK / CC | Collected date/time 04/06/17 14:15 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 17:06	KMP

MW-1S L901583-18 GW

Collected by KK / CC | Collected date/time 04/06/17 15:20 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 16:43	KMP

MW-25S L901583-19 GW

Collected by KK / CC | Collected date/time 04/06/17 16:15 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 16:19	KMP

MW-16S DUP L901583-20 GW

Collected by KK / CC | Collected date/time 04/06/17 13:10 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG968875	1	04/10/17 21:09	04/12/17 15:56	KMP

MW-25S DUP L901583-21 GW

Collected by KK / CC | Collected date/time 04/06/17 16:15 | Received date/time 04/08/17 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Semi Volatile Organic Compounds (GC/MS) by Method 8270 D	WG969214	.91	04/10/17 07:33	04/12/17 15:32	KMP

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford

Brian Ford
Technical Service Representative

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/13/2017 08:54	WG968875
(S) 2-Fluorophenol	*72.6*			*10.0-120*		*04/13/2017 08:54*	WG968875
(S) Phenol-d5	*56.8*			*10.0-120*		*04/13/2017 08:54*	WG968875
(S) 2,4,6-Tribromophenol	*90.4*			*10.0-153*		*04/13/2017 08:54*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 23:45	WG968875
(S) 2-Fluorophenol	*68.9*			*10.0-120*		*04/12/2017 23:45*	WG968875
(S) Phenol-d5	*54.8*			*10.0-120*		*04/12/2017 23:45*	WG968875
(S) 2,4,6-Tribromophenol	*94.3*			*10.0-153*		*04/12/2017 23:45*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 23:21	WG968875
(S) 2-Fluorophenol	*66.4*			*10.0-120*		*04/12/2017 23:21*	WG968875
(S) Phenol-d5	*51.4*			*10.0-120*		*04/12/2017 23:21*	WG968875
(S) 2,4,6-Tribromophenol	*88.5*			*10.0-153*		*04/12/2017 23:21*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 22:58	WG968875
(S) 2-Fluorophenol	*72.8*			*10.0-120*		*04/12/2017 22:58*	WG968875
(S) Phenol-d5	*56.3*			*10.0-120*		*04/12/2017 22:58*	WG968875
(S) 2,4,6-Tribromophenol	*109*			*10.0-153*		*04/12/2017 22:58*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 22:35	WG968875
(S) 2-Fluorophenol	*66.0*			*10.0-120*		*04/12/2017 22:35*	WG968875
(S) Phenol-d5	*52.1*			*10.0-120*		*04/12/2017 22:35*	WG968875
(S) 2,4,6-Tribromophenol	*89.8*			*10.0-153*		*04/12/2017 22:35*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	2.86		0.313	1.00	1	04/12/2017 22:11	WG968875
(S) 2-Fluorophenol	*60.2*			*10.0-120*		*04/12/2017 22:11*	WG968875
(S) Phenol-d5	*47.3*			*10.0-120*		*04/12/2017 22:11*	WG968875
(S) 2,4,6-Tribromophenol	*97.6*			*10.0-153*		*04/12/2017 22:11*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	0.810	J	0.313	1.00	1	04/12/2017 21:48	WG968875
(S) 2-Fluorophenol	*67.1*			*10.0-120*		*04/12/2017 21:48*	WG968875
(S) Phenol-d5	*51.8*			*10.0-120*		*04/12/2017 21:48*	WG968875
(S) 2,4,6-Tribromophenol	*93.5*			*10.0-153*		*04/12/2017 21:48*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 21:24	WG968875
(S) 2-Fluorophenol	*69.9*			*10.0-120*		*04/12/2017 21:24*	WG968875
(S) Phenol-d5	*53.3*			*10.0-120*		*04/12/2017 21:24*	WG968875
(S) 2,4,6-Tribromophenol	*101*			*10.0-153*		*04/12/2017 21:24*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 21:01	WG968875
(S) 2-Fluorophenol	*63.4*			*10.0-120*		*04/12/2017 21:01*	WG968875
(S) Phenol-d5	*47.6*			*10.0-120*		*04/12/2017 21:01*	WG968875
(S) 2,4,6-Tribromophenol	*92.6*			*10.0-153*		*04/12/2017 21:01*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 20:38	WG968875
(S) 2-Fluorophenol	*61.1*			*10.0-120*		*04/12/2017 20:38*	WG968875
(S) Phenol-d5	*47.8*			*10.0-120*		*04/12/2017 20:38*	WG968875
(S) 2,4,6-Tribromophenol	*104*			*10.0-153*		*04/12/2017 20:38*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 20:14	WG968875
(S) 2-Fluorophenol	*60.1*			*10.0-120*		*04/12/2017 20:14*	WG968875
(S) Phenol-d5	*45.5*			*10.0-120*		*04/12/2017 20:14*	WG968875
(S) 2,4,6-Tribromophenol	*83.0*			*10.0-153*		*04/12/2017 20:14*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 19:51	WG968875
(S) 2-Fluorophenol	*67.5*			*10.0-120*		*04/12/2017 19:51*	WG968875
(S) Phenol-d5	*52.4*			*10.0-120*		*04/12/2017 19:51*	WG968875
(S) 2,4,6-Tribromophenol	*94.6*			*10.0-153*		*04/12/2017 19:51*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 19:27	WG968875
(S) 2-Fluorophenol	*62.2*			*10.0-120*		*04/12/2017 19:27*	WG968875
(S) Phenol-d5	*48.4*			*10.0-120*		*04/12/2017 19:27*	WG968875
(S) 2,4,6-Tribromophenol	*98.2*			*10.0-153*		*04/12/2017 19:27*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 19:04	WG968875
(S) 2-Fluorophenol	*58.7*			*10.0-120*		*04/12/2017 19:04*	WG968875
(S) Phenol-d5	*47.1*			*10.0-120*		*04/12/2017 19:04*	WG968875
(S) 2,4,6-Tribromophenol	*80.3*			*10.0-153*		*04/12/2017 19:04*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 18:40	WG968875
(S) 2-Fluorophenol	*70.7*			*10.0-120*		*04/12/2017 18:40*	WG968875
(S) Phenol-d5	*54.3*			*10.0-120*		*04/12/2017 18:40*	WG968875
(S) 2,4,6-Tribromophenol	*103*			*10.0-153*		*04/12/2017 18:40*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	3.58		0.313	1.00	1	04/12/2017 17:30	WG968875
(S) 2-Fluorophenol	*71.5*			*10.0-120*		*04/12/2017 17:30*	WG968875
(S) Phenol-d5	*54.1*			*10.0-120*		*04/12/2017 17:30*	WG968875
(S) 2,4,6-Tribromophenol	*101*			*10.0-153*		*04/12/2017 17:30*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 17:06	WG968875
(S) 2-Fluorophenol	*56.7*			*10.0-120*		*04/12/2017 17:06*	WG968875
(S) Phenol-d5	*45.1*			*10.0-120*		*04/12/2017 17:06*	WG968875
(S) 2,4,6-Tribromophenol	*92.9*			*10.0-153*		*04/12/2017 17:06*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	U		0.313	1.00	1	04/12/2017 16:43	WG968875
(S) 2-Fluorophenol	*58.1*			*10.0-120*		*04/12/2017 16:43*	WG968875
(S) Phenol-d5	*44.4*			*10.0-120*		*04/12/2017 16:43*	WG968875
(S) 2,4,6-Tribromophenol	*82.7*			*10.0-153*		*04/12/2017 16:43*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	191		0.313	1.00	1	04/12/2017 16:19	WG968875
(S) 2-Fluorophenol	*67.4*			*10.0-120*		*04/12/2017 16:19*	WG968875
(S) Phenol-d5	*51.8*			*10.0-120*		*04/12/2017 16:19*	WG968875
(S) 2,4,6-Tribromophenol	*109*			*10.0-153*		*04/12/2017 16:19*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	3.20		0.313	1.00	1	04/12/2017 15:56	WG968875
(S) 2-Fluorophenol	*60.6*			*10.0-120*		*04/12/2017 15:56*	WG968875
(S) Phenol-d5	*46.2*			*10.0-120*		*04/12/2017 15:56*	WG968875
(S) 2,4,6-Tribromophenol	*88.2*			*10.0-153*		*04/12/2017 15:56*	WG968875

Semi Volatile Organic Compounds (GC/MS) by Method 8270 D

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
Pentachlorophenol	49.8		0.285	0.910	.91	04/12/2017 15:32	WG969214
(S) 2-Fluorophenol	*24.3*			*10.0-120*		*04/12/2017 15:32*	WG969214
(S) Phenol-d5	*16.4*			*10.0-120*		*04/12/2017 15:32*	WG969214
(S) 2,4,6-Tribromophenol	*49.0*			*10.0-153*		*04/12/2017 15:32*	WG969214

Method Blank (MB)

(MB) R3210426-3 04/12/17 13:59

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Pentachlorophenol	U		0.313	1.00
(S) Phenol-d5	*60.1*			*10.0-120*
(S) 2-Fluorophenol	*80.8*			*10.0-120*
(S) 2,4,6-Tribromophenol	*92.6*			*10.0-153*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3210426-1 04/12/17 13:12 • (LCSD) R3210426-2 04/12/17 13:35

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Pentachlorophenol	50.0	23.5	29.5	47.1	58.9	20.0-126			22.3	32
(S) Phenol-d5				*65.3*	*58.3*	*10.0-120*				
(S) 2-Fluorophenol				*85.5*	*73.6*	*10.0-120*				
(S) 2,4,6-Tribromophenol				*123*	*110*	*10.0-153*				

L901583-16 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L901583-16 04/12/17 17:30 • (MS) R3210426-4 04/12/17 17:53 • (MSD) R3210426-5 04/12/17 18:17

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Pentachlorophenol	50.0	3.58	42.8	44.2	78.5	81.3	1	10.0-160			3.31	40
(S) Phenol-d5					*59.6*	*57.0*		*10.0-120*				
(S) 2-Fluorophenol					*75.8*	*72.0*		*10.0-120*				
(S) 2,4,6-Tribromophenol					*120*	*116*		*10.0-153*				

Method Blank (MB)

(MB) R3210427-3 04/12/17 15:09

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Pentachlorophenol	U		0.313	1.00
(S) Phenol-d5	*12.0*			*10.0-120*
(S) 2-Fluorophenol	*19.2*			*10.0-120*
(S) 2,4,6-Tribromophenol	*40.8*			*10.0-153*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3210427-1 04/12/17 14:22 • (LCSD) R3210427-2 04/12/17 14:45

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Pentachlorophenol	50.0	21.8	16.4	43.5	32.9	20.0-126			27.9	32
(S) Phenol-d5				*24.6*	*19.7*	*10.0-120*				
(S) 2-Fluorophenol				*36.6*	*29.1*	*10.0-120*				
(S) 2,4,6-Tribromophenol				*63.7*	*61.3*	*10.0-153*				

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
Rec.	Recovery.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.

ACCREDITATIONS & LOCATIONS

ONE LAB. NATIONWIDE.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**

***** Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660
Alaska	UST-080
Arizona	AZ0612
Arkansas	88-0469
California	01157CA
Colorado	TN00003
Conneticut	PH-0197
Florida	E87487
Georgia	NELAP
Georgia [1]	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky [1]	90010
Kentucky [2]	16
Louisiana	AI30792
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086
Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey–NELAP	TN002
New Mexico	TN00003
New York	11742
North Carolina	Env375
North Carolina [1]	DW21704
North Carolina [2]	41
North Dakota	R-140
Ohio–VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	221
South Carolina	84004
South Dakota	n/a
Tennessee [1 4]	2006
Texas	T 104704245-07-TX
Texas [5]	LAB0152
Utah	6157585858
Vermont	VT2006
Virginia	109
Washington	C1915
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

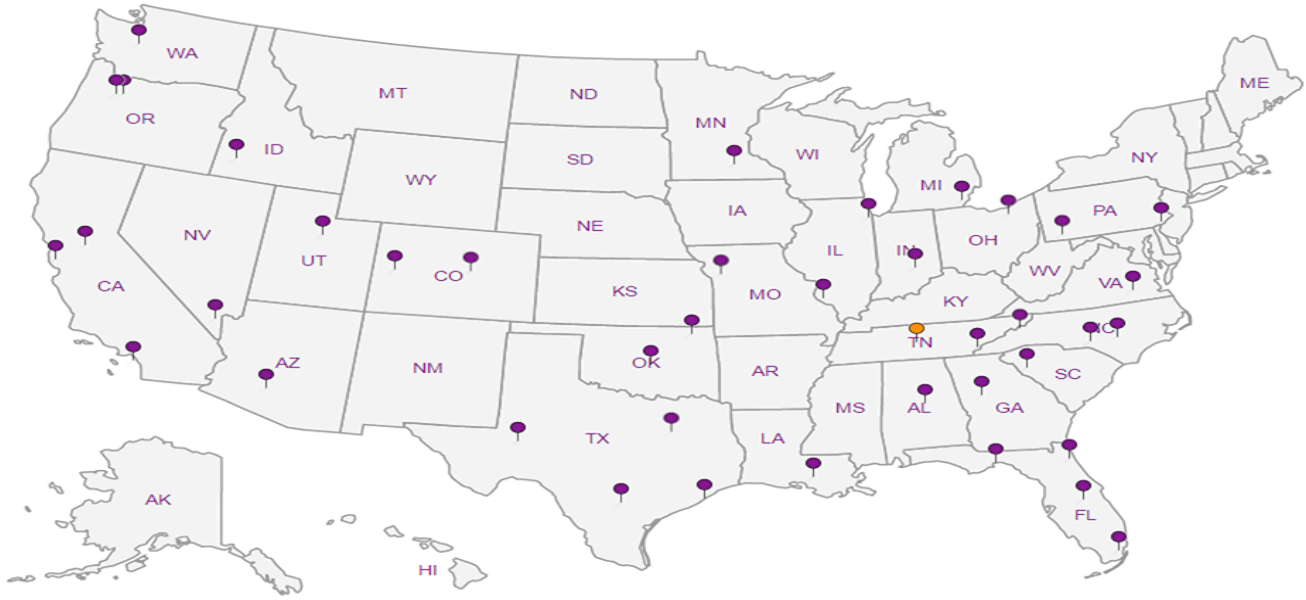
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01
A2LA – ISO 17025 [5]	1461.02
Canada	1461.01
EPA–Crypto	TN00003
AIHA-LAP,LLC	100789
DOD	1461.01
USDA	S-67674

[1.] Drinking Water [2.] Underground Storage Tanks [3.] Aquatic Toxicity [4.] Chemical/Microbiological [5.] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Agency, Authorized Purchaser or Agent:
Oregon DEQ

Send Lab Report To: **Norman Read**
Address: **Department of Environmental Quality**
165 E. 7th Avenue
Eugene, OR 97401
Tel. #: 541-687-7348
E-mail: norm.read@state.or.us

Project Name: **Taylor Lumber**
Project #: **1843-00**
Sampler Name: Kyle Kline and Chris Clough

Contract Laboratory Name: **ESC**
Lab Batch #:

Invoice To: Delia Chadwick - ODEQ/Business Office
Address: 811 SW 6th Ave Portland, OR 97204
Tel. #: (800) 452-4011

Lab Selection Criteria:
- ☐ Proximity (if TAT < 48 hrs)
- ☐ Prior work on same project
- ☒ Cost (for anticipated analyses)
- ☐ Other labs disqualified or unable to perform requested services
- ☐ Emergency work

Turn Around Time:
- ☒ 10 days (std.)
- ☐ 5 days
- ☐ 72 hours
- ☐ 48 hours
- ☐ 24 hours
- ☐ Other

Sample Preservative: None

Requested Analyses

D148

Sample ID#	Collection Date/Time	Matrix	Number of Contain-ers	8270 PCPD	Comments
RW-01	4/4/17 – 1405	GW	2	X	L901583-01
MW-9s	4/4/17 – 1557	GW	2	X	02
PZ-105	4/4/17 – 1654	GW	2	X	03
MW-10s	4/5/17 – 0842	GW	2	X	04
MW-24s	4/5/17 – 0935	GW	2	X	05
MW-15s	4/5/17 – 1048	GW	2	X	06
MW-103s	4/5/17 – 1203	GW	2	X	07
MW-20s	4/5/17 – 1257	GW	2	X	08
MW-19s	4/5/17 – 1356	GW	2	X	09
PZ-101	4/5/17 – 1526	GW	2	X	10
PZ-102	4/5/17 - 1632	GW	2	X	11

Notes: **Log for low level PCP (1 ug/L) using the "8270PCPD" product code.**
CC: Mike Whitson (Apex PM) mwhitson@apexcos.com on lab report. MS/MSD for sample MW-16S MW/MSD

Relinquished By: Chris Clough	Agency/Agent: Apex Companies	Received By:	Agency:
Signature:	Time & Date: 4/7/17 - 1400	Signature:	Time & Date:
Relinquished By:	Agency/Agent:	Received By: Amresha Lotts	Agency/Agent: ESC
Signature:	Time & Date:	Signature:	Time & Date: 8:45 4/8/17

THIS PURCHASE IS SUBMITTED PURSUANT TO STATE OF OREGON SOLICITATION #102-1098-07 AND PRICE AGREEMENT # **8903**. THE PRICE AGREEMENT INCLUDING CONTRACT TERMS AND CONDITIONS AND SPECIAL CONTRACT TERMS AND CONDITIONS (T'S &C'S) CONTAINED IN THE PRICE AGREEMENT ARE HEREBY INCORPORATED BY REFERENCE AND SHALL APPLY TO THIS PURCHASE AND SHALL TAKE PRECEDENCE OVER ALL OTHER CONFLICTING T'S AND C'S, EXPRESS OR IMPLIED.

TRIC# 7176 9011 0240

2.1 ML

Agency, Authorized Purchaser or Agent: Oregon DEQ	Contract Laboratory Name: ESC	Lab Selection Criteria:	Turn Around Time:
Send Lab Report To: Norman Read Address: Department of Environmental Quality 165 E. 7th Avenue Eugene, OR 97401 Tel. #: 541-687-7348 E-mail: norm.read@state.or.us	Lab Batch #: Invoice To: Delia Chadwick - ODEQ/Business Office Address: 811 SW 6th Ave Portland, OR 97204 Tel. #: (800) 452-4011	☐ Proximity (if TAT < 48 hrs) ☐ Prior work on same project ☒ Cost (for anticipated analyses) ☐ Other labs disqualified or unable to perform requested services ☐ Emergency work	☒ 10 days (std.) ☐ 5 days ☐ 72 hours ☐ 48 hours ☐ 24 hours ☐ Other

Project Name: **Taylor Lumber**
Project #: **1843-00**
Sampler Name: Kyle Kline and Chris Clough

Sample Preservative: None

Requested Analyses

Sample ID#	Collection Date/Time	Matrix	Number of Contain-ers	8270 PCPD										Comments
MW-12s	4/6/17 – 1000	GW	2	X										L901583-12
MW-6s	4/6/17 - 1045	GW	2	X										13
MW-6d	4/6/17 – 1110	GW	2	X										14
MW-13s	4/6/17 - 1215	GW	2	X										15
MW-16s	4/6/17 - 1310	GW	2	X										16
MW-11s	4/6/17 – 1415	GW	2	X										17
MW-1s	4/6/17 – 1520	GW	2	X										18
MW-25s	4/6/17 - 1615	GW	2	X										19
MW-16s DUP	4/6/17 – 1310	GW	2	X										20
MW-16s MS/MSD	4/6/17 - 1310	GW	4	MS/MSD										16
MW-25s DUP	4/6/17 - 1615	GW	2	X										21

Notes: **Log for low level PCP (1 ug/L) using the "8270PCPD" product code.**
CC: Mike Whitson (Apex PM) mwhitson@apexcos.com on lab report. MS/MSD for sample MW-16S MW/MSD

Relinquished By: Chris Clough	Agency/Agent: Apex Companies	Received By:	Agency:
Signature:	Time & Date: 4/7/17 - 1400	Signature:	Time & Date:
Relinquished By:	Agency/Agent:	Received By:	Agency/Agent:
Signature:	Time & Date:	Signature:	Time & Date:

THIS PURCHASE IS SUBMITTED PURSUANT TO STATE OF OREGON SOLICITATION #102-1098-07 AND PRICE AGREEMENT # 8903. THE PRICE AGREEMENT INCLUDING CONTRACT TERMS AND CONDITIONS AND SPECIAL CONTRACT TERMS AND CONDITIONS (T'S &C'S) CONTAINED IN THE PRICE AGREEMENT ARE HEREBY INCORPORATED BY REFERENCE AND SHALL APPLY TO THIS PURCHASE AND SHALL TAKE PRECEDENCE OVER ALL OTHER CONFLICTING T'S AND C'S, EXPRESS OR IMPLIED.

2.1 ML

ESC LAB SCIENCES
Cooler Receipt Form

Client:	CRELONDEQ	SDG#	L901583
Cooler Received/Opened On: 4/8/17	Temperature:	2.1	
Received By: Timiesha Scott			
Signature:			

Receipt Check List	NP	Yes	No
COC Seal Present / Intact?	✓		
COC Signed / Accurate?		✓	
Bottles arrive intact?		✓	
Correct bottles used?		✓	
Sufficient volume sent?		✓	
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?			

OREGON

Environmental Laboratory Accreditation Program

NELAP Recognized

Environmental Science Corporation

TN200002

12065 Lebanon Road

Mt. Juliet, TN 37122

IS GRANTED APPROVAL BY ORELAP UNDER THE 2009 TNI STANDARDS, TO PERFORM ANALYSES ON ENVIRONMENTAL SAMPLES IN MATRICES AS LISTED BELOW :

Air	*Drinking Water*	*Non Potable Water*	*Solids and Chem. Waste*	*Tissue*
Chemistry	Chemistry	Chemistry	Chemistry	
	Microbiology	Toxicity Testing		

AND AS RECORDED IN THE LIST OF APPROVED ANALYTES, METHODS, ANALYTICAL TECHNIQUES, AND FIELDS OF TESTING ISSUED CONCURRENTLY WITH THIS CERTIFICATE AND REVISED AS NECESSARY.

ACCREDITED STATUS DEPENDS ON SUCCESSFUL ONGOING PARTICIPATION IN THE PROGRAM AND CONTINUED COMPLIANCE WITH THE STANDARDS.

CUSTOMERS ARE URGED TO VERIFY THE LABORATORY'S CURRENT ACCREDITATION STATUS IN OREGON.

Scott C. Hoatson
Oregon State Public Health Laboratory
Interim Program Manager
3150 NW. 229th Ave, Suite 100
Hillsboro, OR 97124

EFFECTIVE DATE : 01/16/2017

EXPIRATION DATE : 01/15/2018

Certificate No : TN200002 - 008

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Environmental Laboratory Accreditation Program

ORELAP Fields of Accreditation

ORELAP ID: TN200002

Environmental Science Corporation

EPA CODE: TN00003

12065 Lebanon Road

Certificate: TN200002 - 008

Mt. Juliet, TN 37122

Issue Date: 1/16/2017 Expiration Date: 1/15/2018

As of 1/16/2017 this list supercedes all previous lists for this certificate number.

MATRIX	Reference	Code	Analyte	Code	Description
Air					
	EPA TO-15			10248803	VOCs collected in Canisters by GC/MS
		5160	1,1,1-Trichloroethane		
		5110	1,1,2,2-Tetrachloroethane		
		5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		
		5165	1,1,2-Trichloroethane		
		4630	1,1-Dichloroethane		
		4640	1,1-Dichloroethylene		
		5155	1,2,4-Trichlorobenzene		
		5210	1,2,4-Trimethylbenzene		
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)		
		4695	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)		
		4610	1,2-Dichlorobenzene		
		4635	1,2-Dichloroethane (Ethylene dichloride)		
		4655	1,2-Dichloropropane		
		5215	1,3,5-Trimethylbenzene		
		9318	1,3-Butadiene		
		4615	1,3-Dichlorobenzene		
		4620	1,4-Dichlorobenzene		
		4735	1,4-Dioxane (1,4- Diethyleneoxide)		
		4836	1-Propene (Propylene)		
		5220	2,2,4-Trimethylpentane		
		4410	2-Butanone (Methyl ethyl ketone, MEK)		
		4535	2-Chlorotoluene		
		4860	2-Hexanone (MBK)		
		4542	4-Ethyltoluene		
		4995	4-Methyl-2-pentanone (MIBK)		
		4300	Acetaldehyde		
		4315	Acetone		
		4320	Acetonitrile		
		4355	Allyl chloride (3-Chloropropene)		
		4375	Benzene		
		5635	Benzyl chloride		
		4395	Bromodichloromethane		
		4400	Bromoform		
		4450	Carbon disulfide		
		4455	Carbon tetrachloride		
		4475	Chlorobenzene		
		4575	Chlorodibromomethane		

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Air

EPA TO-15

4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4555	Cyclohexane
4625	Dichlorodifluoromethane (Freon-12)
4750	Ethanol
4765	Ethylbenzene
9408	Gasoline range organics (GRO)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4900	Isopropylbenzene (Cumene)
4930	Methanol
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4990	Methyl methacrylate
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5245	m-Xylene
5005	Naphthalene
4435	n-Butylbenzene
4825	n-Heptane
4855	n-Hexane
5090	n-Propylbenzene
5250	o-Xylene
5255	p-Xylene
4440	sec-Butylbenzene
5100	Styrene
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
5115	Tetrachloroethylene (Perchloroethylene)
5120	Tetrahydrofuran (THF)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5230	Vinyl bromide (Bromoethane)
5235	Vinyl chloride
5260	Xylene (total)

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Drinking Water

EPA 150.1			10008409	pH - Electrometric Measurement
	1900	pH		
EPA 1622			10257804	Cryptosporidium by Filtration/IMS/FA
	2510	Cryptosporidia		
EPA 1623			10236609	Filtration/IMS/FA: Cryptosporidium and Giardia
	2510	Cryptosporidia		
	2545	Giardia		
EPA 180.1 2			10011800	Turbidity - Nephelometric
	2055	Turbidity		
EPA 200.7 5			10014003	ICP - metals
	1000	Aluminum		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1055	Copper		
	1760	Hardness (calc.)		
	1070	Iron		
	1085	Magnesium		
	1090	Manganese		
	1105	Nickel		
	1150	Silver		
	1155	Sodium		
	1190	Zinc		
EPA 200.8 5.5			10014809	Metals by ICP-MS
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1030	Cadmium		
	1040	Chromium		
	1055	Copper		
	1075	Lead		
	1090	Manganese		
	1105	Nickel		
	1140	Selenium		
	1150	Silver		

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Drinking Water

EPA 200.8 5.5	1165	Thallium		
	1190	Zinc		
EPA 245.1 3			10036609	Mercury by Cold Vapor Atomic Absorption
	1095	Mercury		
EPA 300.0			10053006	Ion chromatography - anions.
	1540	Bromide		
	1575	Chloride		
	1730	Fluoride		
	1810	Nitrate as N		
	1840	Nitrite as N		
	2000	Sulfate		
EPA 314.0			10055400	Perchlorate in Drinking Water by Ion Chromatography
	1895	Perchlorate		
EPA 335.4			10061402	Methods for the Determination of Inorganic Substances in Environmental Samples
	1645	Total cyanide		
EPA 350.1 2			10063602	Ammonia Nitrogen - Colorimetric, Auto Phenate
	1515	Ammonia as N		
EPA 353.2 2			10067604	Nitrate/Nitrite Nitrogen - Automated, Cadmium
	1810	Nitrate as N		
	1840	Nitrite as N		
EPA 504.1			10083008	EDB/DBCP/TCP micro-extraction, GC/ECD
	4570	1,2-Dibromo-3-chloropropane (DBCP)		
	4585	1,2-Dibromoethane (EDB, Ethylene dibromide)		
EPA 507 2			10084807	Nitrogen & Phosphorous Pesticides (Drinking Water) by GC/NPD
	7005	Alachlor		
	7065	Atrazine		
	7160	Butachlor		
	7835	Metolachlor		
	7845	Metribuzin		
	8125	Simazine		
EPA 524.2 4			10089006	Volatile Organic Compounds by purge and trap GC/MS
	5105	1,1,1,2-Tetrachloroethane		
EPA 524.2 4.1			10088809	Volatile Organic Compounds GC/MS Capillary Column
	5105	1,1,1,2-Tetrachloroethane		
	5160	1,1,1-Trichloroethane		

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Drinking Water	EPA 524.2 4.1	5110	1,1,2,2-Tetrachloroethane
		5165	1,1,2-Trichloroethane
		4630	1,1-Dichloroethane
		4640	1,1-Dichloroethylene
		4670	1,1-Dichloropropene
		5150	1,2,3-Trichlorobenzene
		5180	1,2,3-Trichloropropane
		5155	1,2,4-Trichlorobenzene
		5210	1,2,4-Trimethylbenzene
		4570	1,2-Dibromo-3-chloropropane (DBCP)
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
		4610	1,2-Dichlorobenzene
		4635	1,2-Dichloroethane (Ethylene dichloride)
		4655	1,2-Dichloropropane
		6800	1,3,5-Trichlorobenzene
		5215	1,3,5-Trimethylbenzene
		4615	1,3-Dichlorobenzene
		4660	1,3-Dichloropropane
		4620	1,4-Dichlorobenzene
		4665	2,2-Dichloropropane
		4410	2-Butanone (Methyl ethyl ketone, MEK)
		4535	2-Chlorotoluene
		4860	2-Hexanone (MBK)
		4540	4-Chlorotoluene
		4910	4-Isopropyltoluene (p-Cymene)
		4995	4-Methyl-2-pentanone (MIBK)
		4315	Acetone
		4375	Benzene
		4385	Bromobenzene
		4390	Bromochloromethane
		4395	Bromodichloromethane
		4400	Bromoform
		4450	Carbon disulfide
		4455	Carbon tetrachloride
		4475	Chlorobenzene
		4575	Chlorodibromomethane
		4485	Chloroethane (Ethyl chloride)
		4505	Chloroform
		4645	cis-1,2-Dichloroethylene
		4680	cis-1,3-Dichloropropene
		4595	Dibromomethane (Methylene bromide)
		4625	Dichlorodifluoromethane (Freon-12)
		4765	Ethylbenzene

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Drinking Water

EPA 524.2 4.1	4835	Hexachlorobutadiene		
	4840	Hexachloroethane		
	4870	Iodomethane (Methyl iodide)		
	4900	Isopropylbenzene (Cumene)		
	4950	Methyl bromide (Bromomethane)		
	4960	Methyl chloride (Chloromethane)		
	5000	Methyl tert-butyl ether (MTBE)		
	4975	Methylene chloride (Dichloromethane)		
	5005	Naphthalene		
	4435	n-Butylbenzene		
	5090	n-Propylbenzene		
	4440	sec-Butylbenzene		
	5100	Styrene		
	4445	tert-Butylbenzene		
	5115	Tetrachloroethylene (Perchloroethylene)		
	5140	Toluene		
	4700	trans-1,2-Dichloroethylene		
	4685	trans-1,3-Dichloropropylene		
	4605	trans-1,4-Dichloro-2-butene		
	5170	Trichloroethene (Trichloroethylene)		
	5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)		
	5235	Vinyl chloride		
	5260	Xylene (total)		
EPA 552.2 1			10095804	Haloacetic Acid/Dalapon, Liquid/Liquid Extraction, Derivitization and GC/ECD
	9312	Bromoacetic acid		
	9336	Chloroacetic acid		
	9357	Dibromoacetic acid		
	9360	Dichloroacetic acid		
	9642	Trichloroacetic acid		
SM 2120 B 20th ED			20224004	Color by Visual Comparison
	1605	Color		
SM 2130 B 20th ED			20042404	Turbidity by Nephelometric Determination
	2055	Turbidity		
SM 2150 B 20th ED			20043407	Odor by Threshold Odor Test
	1855	Odor		
SM 2320 B 20th ED			20045209	Alkalinity by Titration
	1505	Alkalinity as CaCO3		
SM 2340 B 20th ED			20046202	Hardness by calculation
	1750	Hardness		

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Environmental Laboratory Accreditation Program

ORELAP Fields of Accreditation

ORELAP ID: TN200002

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EPA CODE: TN00003

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Drinking Water

SM 2510 B 20th ED			20048208	Conductivity by Probe
	1610	Conductivity		
SM 2540 C 20th ED			20050004	Total Dissolved Solids
	1955	Residue-filterable (TDS)		
SM 4110 B 20th ED			20076602	Anions by Ion Chromatography with Chemical Suppression of Eluent
	1575	Chloride		
	1730	Fluoride		
	1810	Nitrate as N		
	1840	Nitrite as N		
	1870	Orthophosphate as P		
	2000	Sulfate		
SM 4500-Cl G 20th ED			20081203	Residual Chlorine by DPD Colorimetric Determination
	1940	Total residual chlorine		
SM 4500-CN C 20th ED			20091605	Cyanide, Total After Distillation
	1635	Cyanide		
SM 4500-CN E 20th ED			20092404	Cyanide by Colorimetric Determination
	1635	Cyanide		
	1645	Total cyanide		
SM 4500-CN G 20th ED			20093203	Cyanide Amenable to Chlorination after Distillation
	1510	Amenable cyanide		
SM 4500-H+ B 20th ED			20104807	pH by Probe
	1900	pH		
SM 4500-NH3 G 20th ED			20111006	Ammonia by Automated Phenate
	1515	Ammonia as N		
SM 4500-NO3⁻ F 20th ED			20116205	Nitrate Nitrogen by Automated Cadmium Reduction Method
	1810	Nitrate as N		
	1840	Nitrite as N		
SM 4500-P E 20th ED			20123802	Phosphorus by Ascorbic Acid Reduction
	1870	Orthophosphate as P		
SM 5310 C 20th ED			20138403	Total Organic Carbon by Persulfate-Ultraviolet Oxidation Method
	2040	Total organic carbon		
SM 5320 B 20th ED			20140403	Absorbable Organic Halogen
	2045	Total organic halides (TOX)		
SM 5540 C 20th ED			20144609	Surfactants as MBAS
	2025	Surfactants - MBAS		

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Drinking Water	SM 5910 B 19th ED	2060	UV 254	20145806	UV absorbing organic constituents
Non-Potable Water	AK101 GRO	9408	Gasoline range organics (GRO)	90015002	Determination of Gasoline Range Organics - Alaska Department of Environmental Conservation
	AK102 DRO	9369	Diesel range organics (DRO)	90015206	Determination of Diesel Range Organics - Alaska Department of Environmental Conservation
	AK103 RRO	9499	Motor Oil	90015400	Determination of Residual Range Organics - Alaska Department of Environmental Conservation
	ASTM D1067-92	1500	Acidity, as CaCO3	30003806	Acidity or Alkalinity of Water
	ASTM D7511-09	1645	Total cyanide	30032985	Total Cyanide by Segmented Flow Injection: In-line UV Digestion & Ampermetric Detection
	EPA 1000	3450	Tox, chronic, fw organism	10114600	Fathead Minnow Larval Survival and Growth, chronic (EPA 821/R-02/013)
	EPA 1002	3450	Tox, chronic, fw organism	10115001	Daphnid Survival and Reproduction, chronic (EPA 821/R-02/013)
	EPA 1010	1780	Ignitability	10116606	Pensky-Martens Closed-Cup Method for Determining Ignitability
	EPA 1010A	1780	Ignitability	10234807	Pensky-Martens Closed-Cup Method for Determining Ignitability
	EPA 120.1	1610	Conductivity	10006403	Conductance - Specific @ 25 C
	EPA 130.1	1750	Hardness	10006801	Hardness - Colorimetric, Automated EDTA
	EPA 1311	9822	Extraction/Preparation	10118806	Toxicity Characteristic Leaching Procedure
	EPA 1312	9822	Extraction/Preparation	10119003	Synthetic Precipitation Leaching Procedure

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EPA 160.4			10256801	Total Volatile Solids, ignition @ 550 C.
	4075	Vol. residue, density, water & solids content of coatings		
EPA 1657			10126008	Organophosphorus Pesticides by Liquid/Liquid Extraction and GC/FPD
	7075	Azinphos-methyl (Guthion)		
	7125	Bolstar (Sulprofos)		
	7300	Chlorpyrifos		
	7315	Coumaphos		
	7395	Demeton-o		
	7385	Demeton-s		
	7410	Diazinon		
	8610	Dichlorovos (DDVP, Dichlorvos)		
	7475	Dimethoate		
	8625	Disulfoton		
	7550	EPN		
	7570	Ethoprop		
	7600	Fensulfothion		
	7605	Fenthion		
	7770	Malathion		
	7785	Merphos		
	7825	Methyl parathion (Parathion, methyl)		
	7850	Mevinphos		
	7905	Naled		
	7985	Phorate		
	8110	Ronnel		
	8155	Sulfotepp		
	8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer		
	8210	Tetraethyl pyrophosphate (TEPP)		
	8245	Tokuthion (Prothiophos)		
	8275	Trichloronate		
EPA 1664A (HEM)			10127807	N-Hexane Extractable Material (Oil and Grease) by Extraction and Gravimetry
	1803	n-Hexane Extractable Material (O&G)		
EPA 1664A (SGT-HEM)			10261606	Silica Gen Treated N-Hexane Extractable Material (Oil and Grease)
	1803	n-Hexane Extractable Material (O&G)		
EPA 1664B			10261617	N-Hexane Extractable Material (Oil and Grease) by Extraction and Gravimetry
	1803	n-Hexane Extractable Material (O&G)		
EPA 1664B (SGT-HEM)			10260628	Silica Gel Treated n-Hexane Extractable Material (Oil & Grease)
	1803	n-Hexane Extractable Material (O&G)		

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EPA 180.1 2			10011800	Turbidity - Nephelometric
	2055	Turbidity		
EPA 200.7 5			10014003	ICP - metals
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1025	Boron		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1050	Cobalt		
	1055	Copper		
	1760	Hardness (calc.)		
	1070	Iron		
	1075	Lead		
	1085	Magnesium		
	1090	Manganese		
	1100	Molybdenum		
	1105	Nickel		
	1125	Potassium		
	1140	Selenium		
	1150	Silver		
	1155	Sodium		
	1165	Thallium		
	1175	Tin		
	1180	Titanium		
	1185	Vanadium		
	1190	Zinc		
EPA 200.8 5.5			10014809	Metals by ICP-MS
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1025	Boron		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1050	Cobalt		
	1055	Copper		

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EPA 200.8 5.5	1070	Iron		
	1075	Lead		
	1085	Magnesium		
	1090	Manganese		
	1100	Molybdenum		
	1105	Nickel		
	1125	Potassium		
	1140	Selenium		
	1150	Silver		
	1155	Sodium		
	1160	Strontium		
	1165	Thallium		
	1170	Thorium		
	1175	Tin		
	1180	Titanium		
	3035	Uranium		
	1185	Vanadium		
	1190	Zinc		
EPA 2000 Fathead minnow Acute MHSF 20ºC			10264809	Fathead Minnow, acute
	3455	Toxicity, acute, fw organism		
EPA 2002 Ceriodaphnia dubia Acute 20% DMW 20ºC			10214605	Cerodaphnia dubia, acute
	3440	Tox, acute, estu & marine organism		
EPA 218.6			10268403	Dissolved Hexavalent Chromium by Ion Chromatography
	1045	Chromium VI		
EPA 245.1 3			10036609	Mercury by Cold Vapor Atomic Absorption
	1095	Mercury		
EPA 300.0 2.1			10053200	Methods for the Determination of Inorganic Substances in Environmental Samples
	1540	Bromide		
	1575	Chloride		
	1730	Fluoride		
	1810	Nitrate as N		
	1820	Nitrate-nitrite		
	1840	Nitrite as N		
	1870	Orthophosphate as P		
	2000	Sulfate		
EPA 3005A			10133207	Acid Digestion of waters for Total Recoverable or Dissolved Metals
	9822	Extraction/Preparation		

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EPA 3010A			10133605	Acid Digestion of Aqueous samples and Extracts for Total Metals
	9822	Extraction/Preparation		
EPA 3015			10133809	Microwave Assisted Acid Digestion of Aqueous Samples and Extracts
	9822	Extraction/Preparation		
EPA 3015A			10134006	Microwave Assisted Acid Digestion of Aqueous Samples and Extracts
	9822	Extraction/Preparation		
EPA 3020A			10134404	Acid Digestion of Aqueous samples and Extracts for Total Metals for Analysis by GFAA
	9822	Extraction/Preparation		
EPA 310.2			10055206	Alkalinity as CaCO3 - Colorimetric, Automated
	1505	Alkalinity as CaCO3		
EPA 335.4			10061402	Methods for the Determination of Inorganic Substances in Environmental Samples
	1635	Cyanide		
EPA 350.1 2			10063602	Ammonia Nitrogen - Colorimetric, Auto Phenate
	1515	Ammonia as N		
EPA 351.2 2			10065404	Total Kjeldahl Nitrogen - Block Digest, Phenate
	1795	Kjeldahl nitrogen - total		
EPA 3510C			10138202	Separatory Funnel Liquid-liquid extraction
	9822	Extraction/Preparation		
EPA 3511			10279808	Organic Compounds in Water by Microextraction
	8031	Extraction/Preparation		
EPA 3520C			10139001	Continuous Liquid-liquid extraction
	9822	Extraction/Preparation		
EPA 353.2 2			10067604	Nitrate/Nitrite Nitrogen - Automated, Cadmium
	1820	Nitrate-nitrite		
	6484	Nitrocellulose		
EPA 365.1 2			10070005	Phosphorous - Colorimetric, Automated persulfate
	1910	Phosphorus, total		
EPA 365.4			10071202	Phosphorous - Colorimetric, automated block.
	1910	Phosphorus, total		
EPA 410.4 2			10077404	Chemical Oxygen Demand - Colorimetric, Automated.
	1565	Chemical oxygen demand		

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EPA 420.4 1			10080203	Phenolics, Total Recoverable by Semi-Automated Colorimetry
	1905	Total phenolics		
EPA 5030B			10153409	Purge and trap for aqueous samples
	9822	Extraction/Preparation		
EPA 5030C			10284603	Purge-and-Trap for Aqueous Samples
	9822	Extraction/Preparation		
EPA 6010B			10155609	ICP - AES
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1025	Boron		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1050	Cobalt		
	1055	Copper		
	1070	Iron		
	1075	Lead		
	1080	Lithium		
	1085	Magnesium		
	1090	Manganese		
	1100	Molybdenum		
	1105	Nickel		
	1125	Potassium		
	1140	Selenium		
	1150	Silver		
	1155	Sodium		
	1160	Strontium		
	1165	Thallium		
	1175	Tin		
	1180	Titanium		
	1185	Vanadium		
	1190	Zinc		
EPA 6010C			10155803	ICP - AES
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		

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EPA 6010C	1025	Boron		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1050	Cobalt		
	1055	Copper		
	1070	Iron		
	1075	Lead		
	1080	Lithium		
	1085	Magnesium		
	1090	Manganese		
	1100	Molybdenum		
	1105	Nickel		
	1125	Potassium		
	1140	Selenium		
	1150	Silver		
	1155	Sodium		
	1160	Strontium		
	1165	Thallium		
	1175	Tin		
	1180	Titanium		
	1185	Vanadium		
	1190	Zinc		
EPA 602			10102202	Purgeable Aromatics by GC/PID Purge & Trap
	4375	Benzene		
	4765	Ethylbenzene		
	5000	Methyl tert-butyl ether (MTBE)		
	4420	tert-Butyl alcohol		
	5140	Toluene		
	5260	Xylene (total)		
EPA 6020			10156000	Inductively Coupled Plasma-Mass Spectrometry
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1025	Boron		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1050	Cobalt		
	1055	Copper		

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EPA 6020			
	1070	Iron	
	1075	Lead	
	1085	Magnesium	
	1090	Manganese	
	1100	Molybdenum	
	1105	Nickel	
	1125	Potassium	
	1140	Selenium	
	1150	Silver	
	1155	Sodium	
	1160	Strontium	
	1165	Thallium	
	1170	Thorium	
	1175	Tin	
	1180	Titanium	
	3035	Uranium	
	1185	Vanadium	
	1190	Zinc	
EPA 6020A		10156408	Inductively Coupled Plasma-Mass Spectrometry
	1000	Aluminum	
	1005	Antimony	
	1010	Arsenic	
	1015	Barium	
	1020	Beryllium	
	1025	Boron	
	1030	Cadmium	
	1035	Calcium	
	1040	Chromium	
	1050	Cobalt	
	1055	Copper	
	1070	Iron	
	1075	Lead	
	1085	Magnesium	
	1090	Manganese	
	1100	Molybdenum	
	1105	Nickel	
	1125	Potassium	
	1140	Selenium	
	1150	Silver	
	1155	Sodium	
	1160	Strontium	
	1165	Thallium	
	1170	Thorium	

Non-Potable Water

EPA 6020A	1175	Tin		
	1180	Titanium		
	3035	Uranium		
	1185	Vanadium		
	1190	Zinc		
EPA 608			10103603	Organochlorine Pesticides & PCBs by GC/ECD
	7355	4,4'-DDD		
	7360	4,4'-DDE		
	7365	4,4'-DDT		
	7025	Aldrin		
	7110	alpha-BHC (alpha-Hexachlorocyclohexane)		
	7240	alpha-Chlordane		
	8880	Aroclor-1016 (PCB-1016)		
	8885	Aroclor-1221 (PCB-1221)		
	8890	Aroclor-1232 (PCB-1232)		
	8895	Aroclor-1242 (PCB-1242)		
	8900	Aroclor-1248 (PCB-1248)		
	8905	Aroclor-1254 (PCB-1254)		
	8910	Aroclor-1260 (PCB-1260)		
	7115	beta-BHC (beta-Hexachlorocyclohexane)		
	7250	Chlordane (tech.)		
	7265	Chloroneb		
	7310	Chlorthalonil (Daconil)		
	7105	delta-BHC		
	7470	Dieldrin		
	7510	Endosulfan I		
	7515	Endosulfan II		
	7520	Endosulfan sulfate		
	7540	Endrin		
	7530	Endrin aldehyde		
	7535	Endrin ketone		
	7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)		
	7245	gamma-Chlordane		
	7685	Heptachlor		
	7690	Heptachlor epoxide		
	6275	Hexachlorobenzene		
	7810	Methoxychlor		
	8250	Toxaphene (Chlorinated camphene)		
EPA 610			10104402	Polynuclear Hydrocarbons by HPLC/UV-VIS
	5500	Acenaphthene		

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EPA 610	5505	Acenaphthylene		
	5555	Anthracene		
	5575	Benzo(a)anthracene		
	5580	Benzo(a)pyrene		
	5590	Benzo(g,h,i)perylene		
	5600	Benzo(k)fluoranthene		
	5585	Benzo[b]fluoranthene		
	5855	Chrysene		
	5895	Dibenz(a,h) anthracene		
	6265	Fluoranthene		
	6270	Fluorene		
	6315	Indeno(1,2,3-cd) pyrene		
	5005	Naphthalene		
	6615	Phenanthrene		
	6665	Pyrene		
EPA 615			10105609	Chlorinated Herbicides by Liquid/Liquid Extraction, Derivitization and GC/ECD
	8560	2,4-DB		
	8595	Dicamba		
	8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)		
	7775	MCPA		
	7780	MCPP		
EPA 622			10106806	Organophosphorus Pesticides by Liquid/Liquid Extraction and GC/NPD
	7125	Bolstar (Sulprofos)		
	7300	Chlorpyrifos		
	7315	Coumaphos		
	7395	Demeton-o		
	7385	Demeton-s		
	8610	Dichlorovos (DDVP, Dichlorvos)		
	7475	Dimethoate		
	7570	Ethoprop		
	7600	Fensulfothion		
	7605	Fenthion		
	7785	Merphos		
	7825	Methyl parathion (Parathion, methyl)		
	7850	Mevinphos		
	7985	Phorate		
	8155	Sulfotepp		
	8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer		
	8210	Tetraethyl pyrophosphate (TEPP)		
	8245	Tokuthion (Prothiophos)		

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EPA 624 — 10107207 — Volatile Organic Compounds by purge and trap GC/MS

5105	1,1,1,2-Tetrachloroethane
5160	1,1,1-Trichloroethane
5110	1,1,2,2-Tetrachloroethane
5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
5165	1,1,2-Trichloroethane
4630	1,1-Dichloroethane
4640	1,1-Dichloroethylene
4670	1,1-Dichloropropene
5150	1,2,3-Trichlorobenzene
5180	1,2,3-Trichloropropane
5182	1,2,3-Trimethylbenzene
5155	1,2,4-Trichlorobenzene
5210	1,2,4-Trimethylbenzene
4570	1,2-Dibromo-3-chloropropane (DBCP)
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
4610	1,2-Dichlorobenzene
4635	1,2-Dichloroethane (Ethylene dichloride)
4655	1,2-Dichloropropane
5215	1,3,5-Trimethylbenzene
4615	1,3-Dichlorobenzene
4660	1,3-Dichloropropane
4620	1,4-Dichlorobenzene
4735	1,4-Dioxane (1,4- Diethyleneoxide)
4665	2,2-Dichloropropane
4410	2-Butanone (Methyl ethyl ketone, MEK)
4500	2-Chloroethyl vinyl ether
4535	2-Chlorotoluene
4860	2-Hexanone (MBK)
5020	2-Nitropropane
4540	4-Chlorotoluene
4910	4-Isopropyltoluene (p-Cymene)
4995	4-Methyl-2-pentanone (MIBK)
4315	Acetone
4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4355	Allyl chloride (3-Chloropropene)
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane

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EPA 624

4395	Bromodichloromethane
4397	Bromoethane (Ethyl Bromide)
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4525	Chloroprene (2-Chloro-1,3-butadiene)
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4555	Cyclohexane
4560	Cyclohexanone
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4725	Diethyl ether
9375	Di-isopropylether (DIPE)
4750	Ethanol
4755	Ethyl acetate
4810	Ethyl methacrylate
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4900	Isopropylbenzene (Cumene)
4925	Methacrylonitrile
4940	Methyl acetate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4990	Methyl methacrylate
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5245	m-Xylene
4365	n-Amyl alcohol (1-Pentanol)
5005	Naphthalene

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EPA 624	4425	n-Butyl alcohol (1-Butanol, n-Butanol)	
	4415	n-Butyl-acetate	
	4435	n-Butylbenzene	
	4855	n-Hexane	
	5027	n-Octane	
	5090	n-Propylbenzene	
	5250	o-Xylene	
	5035	Pentachloroethane	
	5080	Propionitrile (Ethyl cyanide)	
	5255	p-Xylene	
	4440	sec-Butylbenzene	
	5100	Styrene	
	4370	T-amylmethylether (TAME)	
	4420	tert-Butyl alcohol	
	4445	tert-Butylbenzene	
	5115	Tetrachloroethylene (Perchloroethylene)	
	5120	Tetrahydrofuran (THF)	
	5140	Toluene	
	4700	trans-1,2-Dichloroethylene	
	4685	trans-1,3-Dichloropropylene	
	4605	trans-1,4-Dichloro-2-butene	
	5170	Trichloroethene (Trichloroethylene)	
	5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	
	5225	Vinyl acetate	
	5235	Vinyl chloride	
	5260	Xylene (total)	
EPA 625		10300002	Base/Neutrals and Acids by GC/MS
	6715	1,2,4,5-Tetrachlorobenzene	
	5155	1,2,4-Trichlorobenzene	
	6221	1,2-Diphenylhydrazine	
	6420	1,4-Naphthoquinone	
	5790	1-Chloronaphthalene	
	6425	1-Naphthylamine	
	6735	2,3,4,6-Tetrachlorophenol	
	9363	2,3-Dichloroaniline	
	6835	2,4,5-Trichlorophenol	
	6840	2,4,6-Trichlorophenol	
	6000	2,4-Dichlorophenol	
	6130	2,4-Dimethylphenol	
	6175	2,4-Dinitrophenol	
	6185	2,4-Dinitrotoluene (2,4-DNT)	
	6190	2,6-Dinitrotoluene (2,6-DNT)	

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EPA 625

5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2 -methylphenol)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6430	2-Naphthylamine
6460	2-Nitroaniline
6490	2-Nitrophenol
5945	3,3'-Dichlorobenzidine
6465	3-Nitroaniline
5540	4-Aminobiphenyl
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
6700	alpha-Terpineol
5545	Aniline
5555	Anthracene
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
5680	Carbazole
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
5895	Dibenz(a,h) anthracene
5905	Dibenzofuran
6070	Diethyl phthalate
6135	Dimethyl phthalate

Non-Potable Water

EPA 625				
	5925	Di-n-butyl phthalate		
	6200	Di-n-octyl phthalate		
	7580	Famphur		
	6265	Fluoranthene		
	6270	Fluorene		
	6275	Hexachlorobenzene		
	4835	Hexachlorobutadiene		
	6285	Hexachlorocyclopentadiene		
	4840	Hexachloroethane		
	6290	Hexachlorophene		
	6295	Hexachloropropene		
	6315	Indeno(1,2,3-cd) pyrene		
	6320	Isophorone		
	7740	Kepone		
	5005	Naphthalene		
	5875	n-Decane		
	5015	Nitrobenzene		
	6525	n-Nitrosodiethylamine		
	6530	n-Nitrosodimethylamine		
	5025	n-Nitroso-di-n-butylamine		
	6545	n-Nitrosodi-n-propylamine		
	6535	n-Nitrosodiphenylamine		
	6565	n-Nitrosopyrrolidine		
	6580	n-Octadecane		
	6590	Pentachlorobenzene		
	5035	Pentachloroethane		
	6605	Pentachlorophenol		
	6615	Phenanthrene		
	6625	Phenol		
	6665	Pyrene		
	5095	Pyridine		
EPA 7196A			10162400	Chromium Hexavalent colorimetric
	1045	Chromium VI		
EPA 7199			10163005	Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography
	1045	Chromium VI		
EPA 7470A			10165807	Mercury in Liquid Waste by Cold Vapor Atomic Absorption
	1095	Mercury		

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EPA 8011			10173009	1,2-Dibromoethane and 1,2-Dibromo-3-chloropropane by Microextraction and GC/ECD
	4585	1,2-Dibromoethane (EDB, Ethylene dibromide)		
	4580	Dibromochloropropane		
EPA 8015B			10173601	Non-halogenated organics using GC/FID
	9369	Diesel range organics (DRO)		
	4750	Ethanol		
	4785	Ethylene glycol		
	9408	Gasoline range organics (GRO)		
	4930	Methanol		
	6657	Propylene Glycol		
EPA 8015D			10305609	Nonhalogenated Organics Using GC/FID
	9369	Diesel range organics (DRO)		
	4750	Ethanol		
	4785	Ethylene glycol		
	9408	Gasoline range organics (GRO)		
	4930	Methanol		
	6657	Propylene Glycol		
EPA 8021B			10174808	Aromatic and Halogenated Volatiles by GC with PID and/or ECD Purge & Trap
	4375	Benzene		
	4765	Ethylbenzene		
	5000	Methyl tert-butyl ether (MTBE)		
	5245	m-Xylene		
	5250	o-Xylene		
	5255	p-Xylene		
	5140	Toluene		
	5260	Xylene (total)		
EPA 8081A			10178606	Organochlorine Pesticides by GC/ECD
	7355	4,4'-DDD		
	7360	4,4'-DDE		
	7365	4,4'-DDT		
	7005	Alachlor		
	7025	Aldrin		
	7110	alpha-BHC (alpha-Hexachlorocyclohexane)		
	7240	alpha-Chlordane		
	7115	beta-BHC (beta-Hexachlorocyclohexane)		
	7250	Chlordane (tech.)		
	7265	Chloroneb		

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EPA 8081A				
	7310	Chlorthalonil (Daconil)		
	7105	delta-BHC		
	7470	Dieldrin		
	7510	Endosulfan I		
	7515	Endosulfan II		
	7520	Endosulfan sulfate		
	7540	Endrin		
	7530	Endrin aldehyde		
	7535	Endrin ketone		
	7575	Etridiazole		
	7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)		
	7245	gamma-Chlordane		
	7685	Heptachlor		
	7690	Heptachlor epoxide		
	6275	Hexachlorobenzene		
	6285	Hexachlorocyclopentadiene		
	7810	Methoxychlor		
	7975	Permethrin (total)		
	8045	Propachlor (Ramrod)		
	8250	Toxaphene (Chlorinated camphene)		
	8295	Trifluralin (Treflan)		
EPA 8081B			10178800	Organochlorine Pesticides by GC/ECD
	7355	4,4'-DDD		
	7360	4,4'-DDE		
	7365	4,4'-DDT		
	7005	Alachlor		
	7025	Aldrin		
	7110	alpha-BHC (alpha-Hexachlorocyclohexane)		
	7240	alpha-Chlordane		
	7115	beta-BHC (beta-Hexachlorocyclohexane)		
	7250	Chlordane (tech.)		
	7265	Chloroneb		
	7310	Chlorthalonil (Daconil)		
	7105	delta-BHC		
	7470	Dieldrin		
	7510	Endosulfan I		
	7515	Endosulfan II		
	7520	Endosulfan sulfate		
	7540	Endrin		
	7530	Endrin aldehyde		
	7535	Endrin ketone		

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EPA 8081B	7575	Etridiazole		
	7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)		
	7245	gamma-Chlordane		
	7685	Heptachlor		
	7690	Heptachlor epoxide		
	6275	Hexachlorobenzene		
	6285	Hexachlorocyclopentadiene		
	7810	Methoxychlor		
	7975	Permethrin (total)		
	8045	Propachlor (Ramrod)		
	8250	Toxaphene (Chlorinated camphene)		
	8295	Trifluralin (Treflan)		
EPA 8082			10179007	Polychlorinated Biphenyls (PCBs) by GC/ECD
	8880	Aroclor-1016 (PCB-1016)		
	8885	Aroclor-1221 (PCB-1221)		
	8890	Aroclor-1232 (PCB-1232)		
	8895	Aroclor-1242 (PCB-1242)		
	8900	Aroclor-1248 (PCB-1248)		
	8905	Aroclor-1254 (PCB-1254)		
	8910	Aroclor-1260 (PCB-1260)		
EPA 8082A			10179201	Polychlorinated Biphenyls (PCBs) by GC/ECD
	8880	Aroclor-1016 (PCB-1016)		
	8885	Aroclor-1221 (PCB-1221)		
	8890	Aroclor-1232 (PCB-1232)		
	8895	Aroclor-1242 (PCB-1242)		
	8900	Aroclor-1248 (PCB-1248)		
	8905	Aroclor-1254 (PCB-1254)		
	8910	Aroclor-1260 (PCB-1260)		
EPA 8141A			10182000	Organophosphorous Pesticides by GC/NPD
	7075	Azinphos-methyl (Guthion)		
	7125	Bolstar (Sulprofos)		
	7300	Chlorpyrifos		
	7315	Coumaphos		
	7395	Demeton-o		
	7385	Demeton-s		
	7410	Diazinon		
	8610	Dichlorovos (DDVP, Dichlorvos)		
	7475	Dimethoate		
	8625	Disulfoton		
	7550	EPN		
	7570	Ethoprop		

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EPA 8141A				
	7600	Fensulfothion		
	7605	Fenthion		
	7770	Malathion		
	7785	Merphos		
	7825	Methyl parathion (Parathion, methyl)		
	7850	Mevinphos		
	7905	Naled		
	7955	Parathion, ethyl		
	7985	Phorate		
	8110	Ronnel		
	8155	Sulfotepp		
	8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer		
	8210	Tetraethyl pyrophosphate (TEPP)		
	8245	Tokuthion (Prothiophos)		
	8275	Trichloronate		
EPA 8141B			10182204	Organophosphorous Pesticides by GC/NPD
	7075	Azinphos-methyl (Guthion)		
	7125	Bolstar (Sulprofos)		
	7300	Chlorpyrifos		
	7315	Coumaphos		
	7395	Demeton-o		
	7385	Demeton-s		
	7410	Diazinon		
	8610	Dichlorovos (DDVP, Dichlorvos)		
	7475	Dimethoate		
	8625	Disulfoton		
	7550	EPN		
	7570	Ethoprop		
	7600	Fensulfothion		
	7605	Fenthion		
	7770	Malathion		
	7785	Merphos		
	7825	Methyl parathion (Parathion, methyl)		
	7850	Mevinphos		
	7905	Naled		
	7955	Parathion, ethyl		
	7985	Phorate		
	8110	Ronnel		
	8155	Sulfotepp		
	8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer		
	8210	Tetraethyl pyrophosphate (TEPP)		

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EPA 8141B	8245	Tokuthion (Prothiophos)		
	8275	Trichloronate		
EPA 8151A			10183207	Chlorinated Herbicides by GC/ECD
	8655	2,4,5-T		
	8545	2,4-D		
	8560	2,4-DB		
	8555	Dalapon		
	8595	Dicamba		
	8605	Dichloroprop (Dichlorprop)		
	8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)		
	7775	MCPA		
	7780	MCPP		
	8650	Silvex (2,4,5-TP)		
EPA 8260B			10184802	Volatile Organic Compounds by purge and trap GC/MS
	5105	1,1,1,2-Tetrachloroethane		
	5160	1,1,1-Trichloroethane		
	5110	1,1,2,2-Tetrachloroethane		
	5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		
	5165	1,1,2-Trichloroethane		
	4630	1,1-Dichloroethane		
	4640	1,1-Dichloroethylene		
	4670	1,1-Dichloropropene		
	5150	1,2,3-Trichlorobenzene		
	5180	1,2,3-Trichloropropane		
	5155	1,2,4-Trichlorobenzene		
	5210	1,2,4-Trimethylbenzene		
	4570	1,2-Dibromo-3-chloropropane (DBCP)		
	4585	1,2-Dibromoethane (EDB, Ethylene dibromide)		
	4610	1,2-Dichlorobenzene		
	4635	1,2-Dichloroethane (Ethylene dichloride)		
	4655	1,2-Dichloropropane		
	5215	1,3,5-Trimethylbenzene		
	4615	1,3-Dichlorobenzene		
	4660	1,3-Dichloropropane		
	4620	1,4-Dichlorobenzene		
	4735	1,4-Dioxane (1,4- Diethyleneoxide)		
	6380	1-Methylnaphthalene		
	5220	2,2,4-Trimethylpentane		
	4665	2,2-Dichloropropane		
	4410	2-Butanone (Methyl ethyl ketone, MEK)		

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EPA 8260B	4500	2-Chloroethyl vinyl ether
	4535	2-Chlorotoluene
	4860	2-Hexanone (MBK)
	6385	2-Methylnaphthalene
	5020	2-Nitropropane
	9701	3,3'-dimethyl-1-butanol
	4540	4-Chlorotoluene
	4910	4-Isopropyltoluene (p-Cymene)
	4995	4-Methyl-2-pentanone (MIBK)
	4315	Acetone
	4320	Acetonitrile
	4325	Acrolein (Propenal)
	4340	Acrylonitrile
	4355	Allyl chloride (3-Chloropropene)
	4375	Benzene
	4385	Bromobenzene
	4390	Bromochloromethane
	4395	Bromodichloromethane
	4397	Bromoethane (Ethyl Bromide)
	4400	Bromoform
	4450	Carbon disulfide
	4455	Carbon tetrachloride
	4475	Chlorobenzene
	4575	Chlorodibromomethane
	4485	Chloroethane (Ethyl chloride)
	4505	Chloroform
	4525	Chloroprene (2-Chloro-1,3-butadiene)
	4645	cis-1,2-Dichloroethylene
	4680	cis-1,3-Dichloropropene
	4600	cis-1,4-Dichloro-2-butene
	4555	Cyclohexane
	4560	Cyclohexanone
	4580	Dibromochloropropane
	4595	Dibromomethane (Methylene bromide)
	4625	Dichlorodifluoromethane (Freon-12)
	4725	Diethyl ether
	9375	Di-isopropylether (DIPE)
	4750	Ethanol
	4755	Ethyl acetate
	4810	Ethyl methacrylate
	4765	Ethylbenzene
	4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
	4835	Hexachlorobutadiene

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4840	Hexachloroethane
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4900	Isopropylbenzene (Cumene)
4925	Methacrylonitrile
4940	Methyl acetate
4945	Methyl acrylate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4990	Methyl methacrylate
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5245	m-Xylene
5005	Naphthalene
4425	n-Butyl alcohol (1-Butanol, n-Butanol)
4435	n-Butylbenzene
4855	n-Hexane
5025	n-Nitroso-di-n-butylamine
5090	n-Propylbenzene
5250	o-Xylene
5035	Pentachloroethane
5080	Propionitrile (Ethyl cyanide)
5255	p-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4368	tert-amyl alcohol
4420	tert-Butyl alcohol
4445	tert-Butylbenzene
9703	tert-butyl-formate
5115	Tetrachloroethylene (Perchloroethylene)
5120	Tetrahydrofuran (THF)
5140	Toluene
4700	trans-1,2-Dichloroethylene
4685	trans-1,3-Dichloropropylene
4605	trans-1,4-Dichloro-2-butene
5170	Trichloroethene (Trichloroethylene)
5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)
5225	Vinyl acetate
5235	Vinyl chloride

Non-Potable Water

EPA 8260B	5260	Xylene (total)		
EPA 8260C			10307003	Volatile Organics: GC/MS (capillary column)
	5105	1,1,1,2-Tetrachloroethane		
	5160	1,1,1-Trichloroethane		
	5110	1,1,2,2-Tetrachloroethane		
	5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		
	5165	1,1,2-Trichloroethane		
	4630	1,1-Dichloroethane		
	4640	1,1-Dichloroethylene		
	4670	1,1-Dichloropropene		
	5150	1,2,3-Trichlorobenzene		
	5180	1,2,3-Trichloropropane		
	5155	1,2,4-Trichlorobenzene		
	5210	1,2,4-Trimethylbenzene		
	4570	1,2-Dibromo-3-chloropropane (DBCP)		
	4585	1,2-Dibromoethane (EDB, Ethylene dibromide)		
	4610	1,2-Dichlorobenzene		
	4635	1,2-Dichloroethane (Ethylene dichloride)		
	4655	1,2-Dichloropropane		
	5215	1,3,5-Trimethylbenzene		
	4615	1,3-Dichlorobenzene		
	4660	1,3-Dichloropropane		
	4620	1,4-Dichlorobenzene		
	4735	1,4-Dioxane (1,4- Diethyleneoxide)		
	6380	1-Methylnaphthalene		
	5220	2,2,4-Trimethylpentane		
	4665	2,2-Dichloropropane		
	4410	2-Butanone (Methyl ethyl ketone, MEK)		
	4500	2-Chloroethyl vinyl ether		
	4535	2-Chlorotoluene		
	4860	2-Hexanone (MBK)		
	5145	2-Methylaniline (o-Toluidine)		
	6385	2-Methylnaphthalene		
	5020	2-Nitropropane		
	4540	4-Chlorotoluene		
	4910	4-Isopropyltoluene (p-Cymene)		
	4995	4-Methyl-2-pentanone (MIBK)		
	4315	Acetone		
	4320	Acetonitrile		
	4325	Acrolein (Propenal)		

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EPA 8260C

4340	Acrylonitrile
4355	Allyl chloride (3-Chloropropene)
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4397	Bromoethane (Ethyl Bromide)
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4525	Chloroprene (2-Chloro-1,3-butadiene)
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4555	Cyclohexane
4560	Cyclohexanone
4580	Dibromochloropropane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4725	Diethyl ether
9375	Di-isopropylether (DIPE)
4750	Ethanol
4755	Ethyl acetate
4810	Ethyl methacrylate
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4840	Hexachloroethane
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4900	Isopropylbenzene (Cumene)
4925	Methacrylonitrile
4940	Methyl acetate
4945	Methyl acrylate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4990	Methyl methacrylate

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EPA 8260C	5000	Methyl tert-butyl ether (MTBE)	
	4965	Methylcyclohexane	
	4975	Methylene chloride (Dichloromethane)	
	5245	m-Xylene	
	5005	Naphthalene	
	4425	n-Butyl alcohol (1-Butanol, n-Butanol)	
	4435	n-Butylbenzene	
	5015	Nitrobenzene	
	5025	n-Nitroso-di-n-butylamine	
	5090	n-Propylbenzene	
	5250	o-Xylene	
	5035	Pentachloroethane	
	5080	Propionitrile (Ethyl cyanide)	
	5255	p-Xylene	
	6685	Safrole	
	4440	sec-Butylbenzene	
	5100	Styrene	
	4370	T-amylmethylether (TAME)	
	4420	tert-Butyl alcohol	
	4445	tert-Butylbenzene	
	5115	Tetrachloroethylene (Perchloroethylene)	
	5120	Tetrahydrofuran (THF)	
	5140	Toluene	
	4700	trans-1,2-Dichloroethylene	
	4685	trans-1,3-Dichloropropylene	
	4605	trans-1,4-Dichloro-2-butene	
	5170	Trichloroethene (Trichloroethylene)	
	5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	
	5225	Vinyl acetate	
	5235	Vinyl chloride	
	5260	Xylene (total)	
EPA 8270C			10185805 Semivolatile Organic compounds by GC/MS
	6703	1,1'-Biphenyl (BZ-0)	
	6705	1,2,3,4-Tetrachlorobenzene	
	6710	1,2,3,5-Tetrachlorobenzene	
	6715	1,2,4,5-Tetrachlorobenzene	
	5155	1,2,4-Trichlorobenzene	
	4610	1,2-Dichlorobenzene	
	6221	1,2-Diphenylhydrazine	
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)	
	4615	1,3-Dichlorobenzene	
	6160	1,3-Dinitrobenzene (1,3-DNB)	

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4620	1,4-Dichlorobenzene
6420	1,4-Naphthoquinone
5790	1-Chloronaphthalene
6380	1-Methylnaphthalene
6425	1-Naphthylamine
6735	2,3,4,6-Tetrachlorophenol
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5515	2-Acetylaminofluorene
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2 -methylphenol)
5145	2-Methylaniline (o-Toluidine)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6430	2-Naphthylamine
6460	2-Nitroaniline
6490	2-Nitrophenol
5050	2-Picoline (2-Methylpyridine)
5945	3,3'-Dichlorobenzidine
6120	3,3'-Dimethylbenzidine
6355	3-Methylcholanthrene
6465	3-Nitroaniline
5540	4-Aminobiphenyl
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6105	4-Dimethyl aminoazobenzene
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
6510	4-Nitroquinoline 1-oxide
6570	5-Nitro-o-toluidine
6115	7,12-Dimethylbenz(a) anthracene
9417	7h-Dibenzo(c, g) carbazole
6125	a-a-Dimethylphenethylamine

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EPA 8270C

5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
5545	Aniline
5555	Anthracene
5560	Aramite
7065	Atrazine
5565	Benzal chloride
5570	Benzaldehyde
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5625	Benzotrichloride
5630	Benzyl alcohol
5635	Benzyl chloride
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
7180	Caprolactam
5680	Carbazole
7260	Chlorobenzilate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7405	Diallate
9354	Dibenz(a, h) acridine
5900	Dibenz(a, j) acridine
5895	Dibenz(a,h) anthracene
9348	Dibenzo(a, h) pyrene
9351	Dibenzo(a, i) pyrene
5890	Dibenzo(a,e) pyrene
5905	Dibenzofuran
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate

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EPA 8270C	8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
	6205	Diphenylamine
	8625	Disulfoton
	6260	Ethyl methanesulfonate
	7580	Famphur
	6265	Fluoranthene
	6270	Fluorene
	6275	Hexachlorobenzene
	4835	Hexachlorobutadiene
	6285	Hexachlorocyclopentadiene
	4840	Hexachloroethane
	6290	Hexachlorophene
	6295	Hexachloropropene
	6315	Indeno(1,2,3-cd) pyrene
	7725	Isodrin
	6320	Isophorone
	6325	Isosafrole
	7740	Kepone
	6345	Methapyrilene
	6375	Methyl methanesulfonate
	7825	Methyl parathion (Parathion, methyl)
	5005	Naphthalene
	5875	n-Decane
	5015	Nitrobenzene
	6525	n-Nitrosodiethylamine
	6530	n-Nitrosodimethylamine
	5025	n-Nitroso-di-n-butylamine
	6545	n-Nitrosodi-n-propylamine
	6535	n-Nitrosodiphenylamine
	6550	n-Nitrosomethylethalamine
	6555	n-Nitrosomorpholine
	6560	n-Nitrosopiperidine
	6565	n-Nitrosopyrrolidine
	6580	n-Octadecane
	8290	o,o,o-Triethyl phosphorothioate
	7955	Parathion, ethyl
	6590	Pentachlorobenzene
	5035	Pentachloroethane
	6600	Pentachloronitrobenzene
	6605	Pentachlorophenol
	6610	Phenacetin
	6615	Phenanthrene
	6625	Phenol

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EPA 8270C			
	7985	Phorate	
	9663	p-Phenylenediamine	
	6650	Pronamide (Kerb)	
	6665	Pyrene	
	5095	Pyridine	
	6685	Safrole	
	8155	Sulfotepp	
	8235	Thionazin (Zinophos)	
EPA 8270C SIM		10242407	Semivolatile Organic compounds by GC/MS Selective Ion Monitoring
	4735	1,4-Dioxane (1,4- Diethyleneoxide)	
	6380	1-Methylnaphthalene	
	6385	2-Methylnaphthalene	
	5500	Acenaphthene	
	5505	Acenaphthylene	
	5555	Anthracene	
	5575	Benzo(a)anthracene	
	5580	Benzo(a)pyrene	
	5590	Benzo(g,h,i)perylene	
	5600	Benzo(k)fluoranthene	
	5585	Benzo[b]fluoranthene	
	5855	Chrysene	
	5895	Dibenz(a,h) anthracene	
	6265	Fluoranthene	
	6270	Fluorene	
	6315	Indeno(1,2,3-cd) pyrene	
	5005	Naphthalene	
	6615	Phenanthrene	
	6665	Pyrene	
EPA 8270D		10186002	Semivolatile Organic compounds by GC/MS
	6703	1,1'-Biphenyl (BZ-0)	
	6705	1,2,3,4-Tetrachlorobenzene	
	6710	1,2,3,5-Tetrachlorobenzene	
	6715	1,2,4,5-Tetrachlorobenzene	
	5155	1,2,4-Trichlorobenzene	
	4610	1,2-Dichlorobenzene	
	6221	1,2-Diphenylhydrazine	
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)	
	4615	1,3-Dichlorobenzene	
	6160	1,3-Dinitrobenzene (1,3-DNB)	
	4620	1,4-Dichlorobenzene	
	6420	1,4-Naphthoquinone	
	5790	1-Chloronaphthalene	

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EPA 8270D

6380	1-Methylnaphthalene
6425	1-Naphthylamine
6735	2,3,4,6-Tetrachlorophenol
6835	2,4,5-Trichlorophenol
6840	2,4,6-Trichlorophenol
6000	2,4-Dichlorophenol
6130	2,4-Dimethylphenol
6175	2,4-Dinitrophenol
6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5515	2-Acetylaminofluorene
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2 -methylphenol)
5145	2-Methylaniline (o-Toluidine)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6430	2-Naphthylamine
6460	2-Nitroaniline
6490	2-Nitrophenol
5050	2-Picoline (2-Methylpyridine)
5945	3,3'-Dichlorobenzidine
6120	3,3'-Dimethylbenzidine
6355	3-Methylcholanthrene
6465	3-Nitroaniline
5540	4-Aminobiphenyl
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6105	4-Dimethyl aminoazobenzene
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
6510	4-Nitroquinoline 1-oxide
6570	5-Nitro-o-toluidine
6115	7,12-Dimethylbenz(a) anthracene
9417	7h-Dibenzo(c, g) carbazole
6125	a-a-Dimethylphenethylamine
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone

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EPA 8270D

5545	Aniline
5555	Anthracene
5560	Aramite
7065	Atrazine
5565	Benzal chloride
5570	Benzaldehyde
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5625	Benzotrichloride
5630	Benzyl alcohol
5635	Benzyl chloride
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
7180	Caprolactam
5680	Carbazole
7260	Chlorobenzilate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7405	Diallate
9354	Dibenz(a, h) acridine
5900	Dibenz(a, j) acridine
5895	Dibenz(a,h) anthracene
9348	Dibenzo(a, h) pyrene
9351	Dibenzo(a, i) pyrene
5890	Dibenzo(a,e) pyrene
5905	Dibenzofuran
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
6205	Diphenylamine
8625	Disulfoton

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EPA 8270D

6260	Ethyl methanesulfonate
7580	Famphur
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6290	Hexachlorophene
6295	Hexachloropropene
6315	Indeno(1,2,3-cd) pyrene
7725	Isodrin
6320	Isophorone
6325	Isosafrole
7740	Kepone
6345	Methapyrilene
6375	Methyl methanesulfonate
7825	Methyl parathion (Parathion, methyl)
5005	Naphthalene
5875	n-Decane
5015	Nitrobenzene
6525	n-Nitrosodiethylamine
6530	n-Nitrosodimethylamine
5025	n-Nitroso-di-n-butylamine
6545	n-Nitrosodi-n-propylamine
6535	n-Nitrosodiphenylamine
6550	n-Nitrosomethylethalamine
6555	n-Nitrosomorpholine
6560	n-Nitrosopiperidine
6565	n-Nitrosopyrrolidine
6580	n-Octadecane
8290	o,o,o-Triethyl phosphorothioate
7955	Parathion, ethyl
6590	Pentachlorobenzene
5035	Pentachloroethane
6600	Pentachloronitrobenzene
6605	Pentachlorophenol
6610	Phenacetin
6615	Phenanthrene
6625	Phenol
7985	Phorate
9663	p-Phenylenediamine
6650	Pronamide (Kerb)

Non-Potable Water

EPA 8270D	6665	Pyrene		
	5095	Pyridine		
	6685	Safrole		
	8155	Sulfotepp		
	8235	Thionazin (Zinophos)		
EPA 8270D SIM			10242509	Semivolatile Organic compounds by GC/MS Selective Ion Monitoring
	4735	1,4-Dioxane (1,4- Diethyleneoxide)		
	6380	1-Methylnaphthalene		
	6385	2-Methylnaphthalene		
	5500	Acenaphthene		
	5505	Acenaphthylene		
	5555	Anthracene		
	5575	Benzo(a)anthracene		
	5580	Benzo(a)pyrene		
	5590	Benzo(g,h,i)perylene		
	5600	Benzo(k)fluoranthene		
	5585	Benzo[b]fluoranthene		
	5855	Chrysene		
	5895	Dibenz(a,h) anthracene		
	6265	Fluoranthene		
	6270	Fluorene		
	6315	Indeno(1,2,3-cd) pyrene		
	5005	Naphthalene		
	6615	Phenanthrene		
	6665	Pyrene		
EPA 8310			10187607	Polynuclear Aromatic Hydrocarbons by HPLC/UV-VIS
	5500	Acenaphthene		
	5505	Acenaphthylene		
	5555	Anthracene		
	5575	Benzo(a)anthracene		
	5580	Benzo(a)pyrene		
	5590	Benzo(g,h,i)perylene		
	5600	Benzo(k)fluoranthene		
	5585	Benzo[b]fluoranthene		
	5855	Chrysene		
	5895	Dibenz(a,h) anthracene		
	6265	Fluoranthene		
	6270	Fluorene		
	6315	Indeno(1,2,3-cd) pyrene		
	5005	Naphthalene		
	6615	Phenanthrene		
	6665	Pyrene		

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EPA 8330			10189807	Nitroaromatics and Nitramines by HPLC/UV-VIS
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)		
	6160	1,3-Dinitrobenzene (1,3-DNB)		
	9651	2,4,6-Trinitrotoluene (2,4,6-TNT)		
	6185	2,4-Dinitrotoluene (2,4-DNT)		
	6190	2,6-Dinitrotoluene (2,6-DNT)		
	9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)		
	6462	2-Nitroguanidine		
	9507	2-Nitrotoluene		
	9510	3-Nitrotoluene		
	9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)		
	9513	4-Nitrotoluene		
	6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)		
	5015	Nitrobenzene		
	6485	Nitroglycerin		
	9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)		
	9558	Pentaerythritoltetranitrate (PETN)		
	9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)		
EPA 8330A			10190008	Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)		
	6160	1,3-Dinitrobenzene (1,3-DNB)		
	9651	2,4,6-Trinitrotoluene (2,4,6-TNT)		
	6185	2,4-Dinitrotoluene (2,4-DNT)		
	6190	2,6-Dinitrotoluene (2,6-DNT)		
	9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)		
	9507	2-Nitrotoluene		
	9510	3-Nitrotoluene		
	9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)		
	9513	4-Nitrotoluene		
	6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)		
	5015	Nitrobenzene		
	6485	Nitroglycerin		
	9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)		
	9558	Pentaerythritoltetranitrate (PETN)		
	9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)		

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EPA 9010B			10193007	Total and Amenable Cyanide by Distillation and UV-Vis
	1510	Amenable cyanide		
	1645	Total cyanide		
EPA 9010C			10243002	Total and Amenable Cyanide by Distillation and UV-Vis
	1510	Amenable cyanide		
	1645	Total cyanide		
EPA 9012A			10193405	Total and Amenable Cyanide (automated colorimetric with off-line distillation)
	1645	Total cyanide		
EPA 9012B			10243206	Total and Amenable Cyanide (automated colorimetric with off-line distillation)
	1645	Total cyanide		
EPA 9020B			10194408	Total Organic Halides
	2045	Total organic halides (TOX)		
EPA 9030B			10195605	Acid-Soluble and Acid-Insoluble sulfides: Distillation
	2005	Sulfide		
EPA 9034			10196006	Titrimetric Procedure for Acid-Soluble and Acid-Insoluble Sulfides
	2005	Sulfide		
EPA 9040C			10244403	pH Electrometric Measurement
	1900	pH		
EPA 9050A			10198808	Specific Conductance
	1610	Conductivity		
EPA 9056			10199403	Determination of Inorganic Anions by Ion Chromatography
	1540	Bromide		
	1575	Chloride		
	1730	Fluoride		
	1810	Nitrate as N		
	1840	Nitrite as N		
	2000	Sulfate		
EPA 9056A			10199607	Determination of Inorganic Anions by Ion Chromatography
	1540	Bromide		
	1575	Chloride		
	1730	Fluoride		
	1805	Nitrate		
	1835	Nitrite		
	2000	Sulfate		

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EPA 9060			10200201	Total Organic Carbon
	2040	Total organic carbon		
EPA 9060A			10244801	Total Organic Carbon
	2040	Total organic carbon		
EPA 9066			10200609	Phenolics (Colorimetric, Automated 4-AAP with Distillation)
	1905	Total phenolics		
EPA RSK-175 (GC-FID)			10212905	Methane, Ethane, and Ethene in water by Headspace GC/FID
	4747	Ethane		
	4752	Ethene		
	4926	Methane		
	5029	n-Propane		
NWTPH-Dx			90018409	Oregon DEQ TPH Diesel Range
	9369	Diesel range organics (DRO)		
NWTPH-Gx			90018603	Oregon DEQ TPH Gasoline Range Organics by GC/FID-PID Purge & Trap
	9408	Gasoline range organics (GRO)		
NWTPH-HCID			90013200	Oregon DEQ Total Petroleum Hydrocarbon ID
	2050	Total Petroleum Hydrocarbons (TPH)		
OA-1			90013802	Iowa TPH Gx by GC/PID Purge & Trap
	9408	Gasoline range organics (GRO)		
OA-2			90014009	Iowa TPH Dx
	9369	Diesel range organics (DRO)		
SM 2120 B-2001 online			20039309	Color by Visual Comparison
	1605	Color		
SM 2130 B 20th ED			20042404	Turbidity by Nephelometric Determination
	2055	Turbidity		
SM 2310 B-97 online			20044604	Acidity by Titration Method
	1500	Acidity, as CaCO3		
SM 2320 B-97 online			20045607	Alkalinity by Titration Method
	1505	Alkalinity as CaCO3		
SM 2340 B-97 online			20046600	Hardness by calculation
	1755	Total hardness as CaCO3		
SM 2510 B-97 online			20048606	Conductivity by Probe
	1610	Conductivity		
SM 2540 B-97 online			20049405	Total Solids Dried at 103 - 105C
	1950	Residue-total		

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SM 2540 C-97 online			20050402	Total Dissolved Solids Dried at 180C
	1955	Residue-filterable (TDS)		
SM 2540 D-97 online			20051201	Total Suspended Solids Dried at 103 - 105C
	1960	Residue-nonfilterable (TSS)		
SM 2540 F-97 online			20052204	Settleable Solids
	1965	Residue-settleable		
SM 2540 G 20th ED			20005258	Total, Fixed, and Volatile Solids in Solid and Semisolid Samples
	1725	Total, fixed, and volatile residue		
SM 3500-Cr B-2009 online			20066255	Chromium by Colorimetric Method
	1045	Chromium VI		
SM 3500-Fe B 20th ED			20068604	Iron by Colorimetric Method
	1070	Iron		
SM 4110 B-2000			20076908	Anions by Ion Chromatography
	1540	Bromide		
	1575	Chloride		
	1730	Fluoride		
	1810	Nitrate as N		
	1820	Nitrate-nitrite		
	1840	Nitrite as N		
	2000	Sulfate		
SM 4500-Cl G-2000 online			20081612	Chlorine (Residual) by DPD Colorimetric Determination
	1940	Total residual chlorine		
SM 4500-CN C-1999			20095652	Cyanide (Total) after Distillation
	1635	Cyanide		
SM 4500-CN E-1999			20096417	Cyanide by Colorimetric Method
	1635	Cyanide		
	1645	Total cyanide		
SM 4500-CN G-1999 online			20097216	Cyanide Amenable to Chlorination after Distillation
	1510	Amenable cyanide		
SM 4500-H+ B-2000 online			20105219	pH Value by Electrometric Method .
	1900	pH		
SM 4500-NH3 B-97 online			20106007	Ammonia by Preliminary Distillation Step
	1515	Ammonia as N		
SM 4500-NH3 G-97 online			20111404	Ammonia by Automated Phenate Method
	1515	Ammonia as N		

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SM 4500-NO3⁻ F 20th ED			20116205	Nitrate Nitrogen by Automated Cadmium Reduction Method
	1820	Nitrate-nitrite		
SM 4500-Norg C-97 online			20120007	Nitrogen (Organic) by Semi-Micro-Kjeldahl Method
	1790	Kjeldahl nitrogen		
	1795	Kjeldahl nitrogen - total		
SM 4500-O C-2001			20120836	Dissolved Oxygen by Azide Modification
	1880	Oxygen, dissolved		
SM 4500-O G-2001 online			20121657	Dissolved Oxygen by Membrane Electrode Method
	1880	Oxygen, dissolved		
SM 4500-P B 5 20th ED			20123200	Phosphorus by Persulfate Digestion Method
	1910	Phosphorus, total		
SM 4500-P E-1999			20124214	Phosphorous by Ascorbic Acid Method
	1870	Orthophosphate as P		
	1910	Phosphorus, total		
SM 4500-S2 D-2000			20125853	Sulfide by Methylene Blue Method
	2005	Sulfide		
SM 4500-SO3⁻ B-2000 online			20130625	Sulfite by Iodometric Method
	2015	Sulfite-SO3		
SM 5210 B-2001 online			20135255	Biochemical Oxygen Demand (BOD), 5-Day
	1530	Biochemical oxygen demand		
	1555	Carbonaceous BOD, CBOD		
SM 5220 D-97 online			20136805	COD by Closed Reflux, Colorimetric Method
	1565	Chemical oxygen demand		
SM 5310 B-2000			20137819	Total Organic Carbon (TOC) by Combustion Infra-red Method
	2040	Total organic carbon		
SM 5320 B 20th ED			20140403	Absorbable Organic Halogen
	2045	Total organic halides (TOX)		
SM 5520 B 20th ED			20141202	Oil and Grease by Extraction and Gravimetric Determination
	1860	Oil & Grease		
SM 5540 C 20th ED			20144609	Surfactants as MBAS
	2025	Surfactants - MBAS		
SM 6200 B 20th ED			20146605	Volatile Organic Compounds by purge and trap GC/MS
	5105	1,1,1,2-Tetrachloroethane		
	5160	1,1,1-Trichloroethane		
	5110	1,1,2,2-Tetrachloroethane		

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Non-Potable Water	SM 6200 B 20th ED	5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
		5165	1,1,2-Trichloroethane
		4630	1,1-Dichloroethane
		4640	1,1-Dichloroethylene
		4670	1,1-Dichloropropene
		5150	1,2,3-Trichlorobenzene
		5180	1,2,3-Trichloropropane
		5182	1,2,3-Trimethylbenzene
		5155	1,2,4-Trichlorobenzene
		5210	1,2,4-Trimethylbenzene
		4570	1,2-Dibromo-3-chloropropane (DBCP)
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
		4610	1,2-Dichlorobenzene
		4635	1,2-Dichloroethane (Ethylene dichloride)
		4655	1,2-Dichloropropane
		5215	1,3,5-Trimethylbenzene
		4615	1,3-Dichlorobenzene
		4660	1,3-Dichloropropane
		4620	1,4-Dichlorobenzene
		4735	1,4-Dioxane (1,4- Diethyleneoxide)
		4665	2,2-Dichloropropane
		4410	2-Butanone (Methyl ethyl ketone, MEK)
		4500	2-Chloroethyl vinyl ether
		4535	2-Chlorotoluene
		4860	2-Hexanone (MBK)
		4540	4-Chlorotoluene
		4910	4-Isopropyltoluene (p-Cymene)
		4995	4-Methyl-2-pentanone (MIBK)
		4315	Acetone
		4320	Acetonitrile
		4325	Acrolein (Propenal)
		4340	Acrylonitrile
		4355	Allyl chloride (3-Chloropropene)
		4375	Benzene
		4385	Bromobenzene
		4390	Bromochloromethane
		4395	Bromodichloromethane
		4398	Bromoethene
		4400	Bromoform
		4450	Carbon disulfide
		4455	Carbon tetrachloride
		4475	Chlorobenzene

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SM 6200 B 20th ED

4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4525	Chloroprene (2-Chloro-1,3-butadiene)
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4560	Cyclohexanone
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4725	Diethyl ether
9375	Di-isopropylether (DIPE)
4750	Ethanol
4755	Ethyl acetate
4810	Ethyl methacrylate
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4900	Isopropylbenzene (Cumene)
4925	Methacrylonitrile
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4990	Methyl methacrylate
5000	Methyl tert-butyl ether (MTBE)
4975	Methylene chloride (Dichloromethane)
5245	m-Xylene
5005	Naphthalene
4435	n-Butylbenzene
4855	n-Hexane
5090	n-Propylbenzene
5250	o-Xylene
5035	Pentachloroethane
5080	Propionitrile (Ethyl cyanide)
5255	p-Xylene
4440	sec-Butylbenzene
5100	Styrene
4370	T-amylmethylether (TAME)
4420	tert-Butyl alcohol
4445	tert-Butylbenzene

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SM 6200 B 20th ED				
	5115	Tetrachloroethylene (Perchloroethylene)		
	5120	Tetrahydrofuran (THF)		
	5140	Toluene		
	4700	trans-1,2-Dichloroethylene		
	4685	trans-1,3-Dichloropropylene		
	4605	trans-1,4-Dichloro-2-butene		
	5170	Trichloroethene (Trichloroethylene)		
	5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)		
	5225	Vinyl acetate		
	5235	Vinyl chloride		
	5260	Xylene (total)		
SM 6200 C 20th ED			20147200	Volatile Aromatic Organic Compounds by GC/PID Purge & Trap
	4375	Benzene		
	4765	Ethylbenzene		
	5000	Methyl tert-butyl ether (MTBE)		
	4420	tert-Butyl alcohol		
	5140	Toluene		
	5260	Xylene (total)		
SM 6630 B 20th ED			20153008	Organochlorine Pesticides by Liquid/Liquid Extraction and GC/ECD
	8295	Trifluralin (Treflan)		
SM 6630 C 20th ED			20153804	Organochlorine Pesticides and PCBs by Liquid/Liquid Extraction and GC/ECD
	7355	4,4'-DDD		
	7360	4,4'-DDE		
	7365	4,4'-DDT		
	7025	Aldrin		
	7110	alpha-BHC (alpha-Hexachlorocyclohexane)		
	7240	alpha-Chlordane		
	7115	beta-BHC (beta-Hexachlorocyclohexane)		
	7250	Chlordane (tech.)		
	7105	delta-BHC		
	7470	Dieldrin		
	7510	Endosulfan I		
	7515	Endosulfan II		
	7520	Endosulfan sulfate		
	7540	Endrin		
	7530	Endrin aldehyde		
	7535	Endrin ketone		
	7575	Etridiazole		
	7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)		

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SM 6630 C 20th ED	7245	gamma-Chlordane		
	7685	Heptachlor		
	7690	Heptachlor epoxide		
	7810	Methoxychlor		
	8250	Toxaphene (Chlorinated camphene)		
SM 6640 B 19th ED			20154409	Chlorinated Phenoxy Herbicides by Liquid-Liquid and GC/ECD
	8655	2,4,5-T		
	8545	2,4-D		
	8555	Dalapon		
	8650	Silvex (2,4,5-TP)		

Solids

AK101 GRO			90015002	Determination of Gasoline Range Organics - Alaska Department of Environmental Conservation
	9408	Gasoline range organics (GRO)		
AK102 DRO			90015206	Determination of Diesel Range Organics - Alaska Department of Environmental Conservation
	9369	Diesel range organics (DRO)		
AK103 RRO			90015400	Determination of Residual Range Organics - Alaska Department of Environmental Conservation
	9499	Motor Oil		
EPA 1010			10116606	Pensky-Martens Closed-Cup Method for Determining Ignitability
	1780	Ignitability		
EPA 1010A			10234807	Pensky-Martens Closed-Cup Method for Determining Ignitability
	1780	Ignitability		
EPA 1311			10118806	Toxicity Characteristic Leaching Procedure
	9822	Extraction/Preparation		
EPA 1312			10119003	Synthetic Precipitation Leaching Procedure
	9822	Extraction/Preparation		
EPA 3051			10135805	Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils
	9822	Extraction/Preparation		
EPA 3051A			10136002	Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils
	9822	Extraction/Preparation		
EPA 3052			10136206	Microwave Assisted Acid Digestion of Siliceous and Organically Based Matrices
	9822	Extraction/Preparation		

Solids

EPA 3060A			10136604	Alkaline Digestion for Hexavalent Chromium
	9822	Extraction/Preparation		
EPA 3540C			10140202	Soxhlet Extraction
	9822	Extraction/Preparation		
EPA 3546			10141205	Microwave Extraction
	9822	Extraction/Preparation		
EPA 3550B			10141807	Ultrasonic Extraction
	9822	Extraction/Preparation		
EPA 3550C			10142004	Ultrasonic Extraction
	9822	Extraction/Preparation		
EPA 3580A			10143007	Waste Dilution
	9822	Extraction/Preparation		
EPA 3585			10143201	Waste Dilution for Volatile Organics
	9822	Extraction/Preparation		
EPA 3610B			10144602	Alumina Cleanup
	9822	Extraction/Preparation		
EPA 3611B			10145207	Alumina Column Cleanup and separation of petroleum wastes
	9822	Extraction/Preparation		
EPA 3620C			10146006	Florisil Cleanup
	9822	Extraction/Preparation		
EPA 3630C			10146802	Silica gel cleanup
	9822	Extraction/Preparation		
EPA 3660B			10148400	Sulfur cleanup
	9822	Extraction/Preparation		
EPA 3665A			10148808	Sulfuric Acid / permanganate Cleanup
	9822	Extraction/Preparation		
EPA 5035A			10284807	Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples
	9822	Extraction/Preparation		
EPA 6010B			10155609	ICP - AES
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1025	Boron		
	1030	Cadmium		

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EPA 6010B	1035	Calcium	
	1040	Chromium	
	1050	Cobalt	
	1055	Copper	
	1070	Iron	
	1075	Lead	
	1080	Lithium	
	1085	Magnesium	
	1090	Manganese	
	1100	Molybdenum	
	1105	Nickel	
	1125	Potassium	
	1140	Selenium	
	1150	Silver	
	1155	Sodium	
	1160	Strontium	
	1165	Thallium	
	1175	Tin	
	1180	Titanium	
	1185	Vanadium	
	1190	Zinc	
EPA 6010C			10155803 ICP - AES
	1000	Aluminum	
	1005	Antimony	
	1010	Arsenic	
	1015	Barium	
	1020	Beryllium	
	1025	Boron	
	1030	Cadmium	
	1035	Calcium	
	1040	Chromium	
	1050	Cobalt	
	1055	Copper	
	1070	Iron	
	1075	Lead	
	1080	Lithium	
	1085	Magnesium	
	1090	Manganese	
	1100	Molybdenum	
	1105	Nickel	
	1125	Potassium	
	1140	Selenium	
	1150	Silver	

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EPA 6010C	1155	Sodium		
	1160	Strontium		
	1165	Thallium		
	1175	Tin		
	1180	Titanium		
	1185	Vanadium		
	1190	Zinc		
EPA 6020			10156000	Inductively Coupled Plasma-Mass Spectrometry
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		
	1020	Beryllium		
	1025	Boron		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1050	Cobalt		
	1055	Copper		
	1070	Iron		
	1075	Lead		
	1085	Magnesium		
	1090	Manganese		
	1100	Molybdenum		
	1105	Nickel		
	1125	Potassium		
	1140	Selenium		
	1150	Silver		
	1155	Sodium		
	1160	Strontium		
	1165	Thallium		
	1170	Thorium		
	1175	Tin		
	1180	Titanium		
	3035	Uranium		
	1185	Vanadium		
	1190	Zinc		
EPA 6020A			10156408	Inductively Coupled Plasma-Mass Spectrometry
	1000	Aluminum		
	1005	Antimony		
	1010	Arsenic		
	1015	Barium		

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EPA 6020A	1020	Beryllium		
	1025	Boron		
	1030	Cadmium		
	1035	Calcium		
	1040	Chromium		
	1050	Cobalt		
	1055	Copper		
	1070	Iron		
	1075	Lead		
	1085	Magnesium		
	1090	Manganese		
	1100	Molybdenum		
	1105	Nickel		
	1125	Potassium		
	1140	Selenium		
	1150	Silver		
	1155	Sodium		
	1160	Strontium		
	1165	Thallium		
	1170	Thorium		
	1175	Tin		
	1180	Titanium		
	3035	Uranium		
	1185	Vanadium		
	1190	Zinc		
EPA 7196A			10162400	Chromium Hexavalent colorimetric
	1045	Chromium VI		
EPA 7199			10163005	Determination of Hexavalent Chromium in Drinking Water, Groundwater and Industrial Wastewater Effluents by Ion Chromatography
	1045	Chromium VI		
EPA 7471A			10166208	Mercury in Solid Waste by Cold Vapor Atomic Absorption
	1095	Mercury		
EPA 7471B			10166402	Mercury by Cold Vapor Atomic Absorption
	1095	Mercury		
EPA 8015B			10173601	Non-halogenated organics using GC/FID
	9369	Diesel range organics (DRO)		
	4750	Ethanol		
	4785	Ethylene glycol		
	9408	Gasoline range organics (GRO)		
	4930	Methanol		

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EPA 8015B	6657	Propylene Glycol		
EPA 8015D			10305609	Nonhalogenated Organics Using GC/FID
	9369	Diesel range organics (DRO)		
	4750	Ethanol		
	4785	Ethylene glycol		
	9408	Gasoline range organics (GRO)		
	4930	Methanol		
	6657	Propylene Glycol		
EPA 8021B			10174808	Aromatic and Halogenated Volatiles by GC with PID and/or ECD Purge & Trap
	4375	Benzene		
	4765	Ethylbenzene		
	5000	Methyl tert-butyl ether (MTBE)		
	5245	m-Xylene		
	5250	o-Xylene		
	5255	p-Xylene		
	5140	Toluene		
	5260	Xylene (total)		
EPA 8081A			10178606	Organochlorine Pesticides by GC/ECD
	7355	4,4'-DDD		
	7360	4,4'-DDE		
	7365	4,4'-DDT		
	7005	Alachlor		
	7025	Aldrin		
	7110	alpha-BHC (alpha-Hexachlorocyclohexane)		
	7240	alpha-Chlordane		
	7115	beta-BHC (beta-Hexachlorocyclohexane)		
	7250	Chlordane (tech.)		
	7265	Chloroneb		
	7310	Chlorthalonil (Daconil)		
	7105	delta-BHC		
	7470	Dieldrin		
	7510	Endosulfan I		
	7515	Endosulfan II		
	7520	Endosulfan sulfate		
	7540	Endrin		
	7530	Endrin aldehyde		
	7535	Endrin ketone		
	7575	Etridiazole		

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EPA 8081A	7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)		
	7245	gamma-Chlordane		
	7685	Heptachlor		
	7690	Heptachlor epoxide		
	6275	Hexachlorobenzene		
	6285	Hexachlorocyclopentadiene		
	7810	Methoxychlor		
	7975	Permethrin (total)		
	8045	Propachlor (Ramrod)		
	8250	Toxaphene (Chlorinated camphene)		
	8295	Trifluralin (Treflan)		
EPA 8081B			10178800	Organochlorine Pesticides by GC/ECD
	7355	4,4'-DDD		
	7360	4,4'-DDE		
	7365	4,4'-DDT		
	7005	Alachlor		
	7025	Aldrin		
	7110	alpha-BHC (alpha-Hexachlorocyclohexane)		
	7240	alpha-Chlordane		
	7115	beta-BHC (beta-Hexachlorocyclohexane)		
	7250	Chlordane (tech.)		
	7265	Chloroneb		
	7310	Chlorthalonil (Daconil)		
	7105	delta-BHC		
	7470	Dieldrin		
	7510	Endosulfan I		
	7515	Endosulfan II		
	7520	Endosulfan sulfate		
	7540	Endrin		
	7530	Endrin aldehyde		
	7535	Endrin ketone		
	7575	Etridiazole		
	7120	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)		
	7245	gamma-Chlordane		
	7685	Heptachlor		
	7690	Heptachlor epoxide		
	6275	Hexachlorobenzene		
	6285	Hexachlorocyclopentadiene		
	7810	Methoxychlor		
	7975	Permethrin (total)		

Solids

EPA 8081B	8045	Propachlor (Ramrod)		
	8250	Toxaphene (Chlorinated camphene)		
	8295	Trifluralin (Treflan)		
EPA 8082			10179007	Polychlorinated Biphenyls (PCBs) by GC/ECD
	8880	Aroclor-1016 (PCB-1016)		
	8885	Aroclor-1221 (PCB-1221)		
	8890	Aroclor-1232 (PCB-1232)		
	8895	Aroclor-1242 (PCB-1242)		
	8900	Aroclor-1248 (PCB-1248)		
	8905	Aroclor-1254 (PCB-1254)		
	8910	Aroclor-1260 (PCB-1260)		
EPA 8082A			10179201	Polychlorinated Biphenyls (PCBs) by GC/ECD
	8880	Aroclor-1016 (PCB-1016)		
	8885	Aroclor-1221 (PCB-1221)		
	8890	Aroclor-1232 (PCB-1232)		
	8895	Aroclor-1242 (PCB-1242)		
	8900	Aroclor-1248 (PCB-1248)		
	8905	Aroclor-1254 (PCB-1254)		
	8910	Aroclor-1260 (PCB-1260)		
EPA 8141A			10182000	Organophosphorous Pesticides by GC/NPD
	7075	Azinphos-methyl (Guthion)		
	7125	Bolstar (Sulprofos)		
	7300	Chlorpyrifos		
	7315	Coumaphos		
	7395	Demeton-o		
	7385	Demeton-s		
	7410	Diazinon		
	8610	Dichlorovos (DDVP, Dichlorvos)		
	7475	Dimethoate		
	8625	Disulfoton		
	7550	EPN		
	7570	Ethoprop		
	7600	Fensulfothion		
	7605	Fenthion		
	7770	Malathion		
	7785	Merphos		
	7825	Methyl parathion (Parathion, methyl)		
	7850	Mevinphos		
	7905	Naled		
	7955	Parathion, ethyl		
	7985	Phorate		

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EPA 8141A	8110	Ronnel		
	8155	Sulfotepp		
	8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer		
	8210	Tetraethyl pyrophosphate (TEPP)		
	8245	Tokuthion (Prothiophos)		
	8275	Trichloronate		
EPA 8141B			10182204	Organophosphorous Pesticides by GC/NPD
	7075	Azinphos-methyl (Guthion)		
	7125	Bolstar (Sulprofos)		
	7300	Chlorpyrifos		
	7315	Coumaphos		
	7395	Demeton-o		
	7385	Demeton-s		
	7410	Diazinon		
	8610	Dichlorovos (DDVP, Dichlorvos)		
	7475	Dimethoate		
	8625	Disulfoton		
	7550	EPN		
	7570	Ethoprop		
	7600	Fensulfothion		
	7605	Fenthion		
	7770	Malathion		
	7785	Merphos		
	7825	Methyl parathion (Parathion, methyl)		
	7850	Mevinphos		
	7905	Naled		
	7955	Parathion, ethyl		
	7985	Phorate		
	8110	Ronnel		
	8155	Sulfotepp		
	8200	Tetrachlorvinphos (Stirophos, Gardona) Z-isomer		
	8210	Tetraethyl pyrophosphate (TEPP)		
	8245	Tokuthion (Prothiophos)		
	8275	Trichloronate		
EPA 8151A			10183207	Chlorinated Herbicides by GC/ECD
	8655	2,4,5-T		
	8545	2,4-D		
	8560	2,4-DB		
	8555	Dalapon		
	8595	Dicamba		
	8605	Dichloroprop (Dichlorprop)		

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Solids

EPA 8151A	8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)		
	7775	MCPA		
	7780	MCPP		
	8650	Silvex (2,4,5-TP)		
EPA 8260B			10184802	Volatile Organic Compounds by purge and trap GC/MS
	5105	1,1,1,2-Tetrachloroethane		
	5160	1,1,1-Trichloroethane		
	5110	1,1,2,2-Tetrachloroethane		
	5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		
	5165	1,1,2-Trichloroethane		
	4630	1,1-Dichloroethane		
	4640	1,1-Dichloroethylene		
	4670	1,1-Dichloropropene		
	5150	1,2,3-Trichlorobenzene		
	5180	1,2,3-Trichloropropane		
	5155	1,2,4-Trichlorobenzene		
	5210	1,2,4-Trimethylbenzene		
	4570	1,2-Dibromo-3-chloropropane (DBCP)		
	4585	1,2-Dibromoethane (EDB, Ethylene dibromide)		
	4610	1,2-Dichlorobenzene		
	4635	1,2-Dichloroethane (Ethylene dichloride)		
	4655	1,2-Dichloropropane		
	5215	1,3,5-Trimethylbenzene		
	4615	1,3-Dichlorobenzene		
	4660	1,3-Dichloropropane		
	4620	1,4-Dichlorobenzene		
	4735	1,4-Dioxane (1,4- Diethyleneoxide)		
	6380	1-Methylnaphthalene		
	5220	2,2,4-Trimethylpentane		
	4665	2,2-Dichloropropane		
	4410	2-Butanone (Methyl ethyl ketone, MEK)		
	4500	2-Chloroethyl vinyl ether		
	4535	2-Chlorotoluene		
	4860	2-Hexanone (MBK)		
	6385	2-Methylnaphthalene		
	5020	2-Nitropropane		
	9701	3,3'-dimethyl-1-butanol		
	4540	4-Chlorotoluene		
	4910	4-Isopropyltoluene (p-Cymene)		
	4995	4-Methyl-2-pentanone (MIBK)		
	4315	Acetone		

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Solids EPA 8260B

4320	Acetonitrile
4325	Acrolein (Propenal)
4340	Acrylonitrile
4355	Allyl chloride (3-Chloropropene)
4375	Benzene
4385	Bromobenzene
4390	Bromochloromethane
4395	Bromodichloromethane
4397	Bromoethane (Ethyl Bromide)
4400	Bromoform
4450	Carbon disulfide
4455	Carbon tetrachloride
4475	Chlorobenzene
4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4525	Chloroprene (2-Chloro-1,3-butadiene)
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4555	Cyclohexane
4560	Cyclohexanone
4580	Dibromochloropropane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4725	Diethyl ether
9375	Di-isopropylether (DIPE)
4750	Ethanol
4755	Ethyl acetate
4810	Ethyl methacrylate
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4840	Hexachloroethane
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4900	Isopropylbenzene (Cumene)
4925	Methacrylonitrile
4940	Methyl acetate
4945	Methyl acrylate
4950	Methyl bromide (Bromomethane)

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Solids

EPA 8260B	4960	Methyl chloride (Chloromethane)	
	4990	Methyl methacrylate	
	5000	Methyl tert-butyl ether (MTBE)	
	4965	Methylcyclohexane	
	4975	Methylene chloride (Dichloromethane)	
	5245	m-Xylene	
	5005	Naphthalene	
	4425	n-Butyl alcohol (1-Butanol, n-Butanol)	
	4435	n-Butylbenzene	
	4855	n-Hexane	
	5025	n-Nitroso-di-n-butylamine	
	5090	n-Propylbenzene	
	5250	o-Xylene	
	5035	Pentachloroethane	
	5080	Propionitrile (Ethyl cyanide)	
	5255	p-Xylene	
	4440	sec-Butylbenzene	
	5100	Styrene	
	4370	T-amylmethylether (TAME)	
	4368	tert-amyl alcohol	
	4420	tert-Butyl alcohol	
	4445	tert-Butylbenzene	
	9703	tert-butyl-formate	
	5115	Tetrachloroethylene (Perchloroethylene)	
	5120	Tetrahydrofuran (THF)	
	5140	Toluene	
	4700	trans-1,2-Dichloroethylene	
	4685	trans-1,3-Dichloropropylene	
	4605	trans-1,4-Dichloro-2-butene	
	5170	Trichloroethene (Trichloroethylene)	
	5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	
	5225	Vinyl acetate	
	5235	Vinyl chloride	
	5260	Xylene (total)	
EPA 8260C			10307003 Volatile Organics: GC/MS (capillary column)
	5105	1,1,1,2-Tetrachloroethane	
	5160	1,1,1-Trichloroethane	
	5110	1,1,2,2-Tetrachloroethane	
	5195	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	
	5165	1,1,2-Trichloroethane	
	4630	1,1-Dichloroethane	

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Solids	EPA 8260C	4640	1,1-Dichloroethylene
		4670	1,1-Dichloropropene
		5150	1,2,3-Trichlorobenzene
		5180	1,2,3-Trichloropropane
		5155	1,2,4-Trichlorobenzene
		5210	1,2,4-Trimethylbenzene
		4570	1,2-Dibromo-3-chloropropane (DBCP)
		4585	1,2-Dibromoethane (EDB, Ethylene dibromide)
		4610	1,2-Dichlorobenzene
		4635	1,2-Dichloroethane (Ethylene dichloride)
		4655	1,2-Dichloropropane
		5215	1,3,5-Trimethylbenzene
		4615	1,3-Dichlorobenzene
		4660	1,3-Dichloropropane
		4620	1,4-Dichlorobenzene
		4735	1,4-Dioxane (1,4- Diethyleneoxide)
		6380	1-Methylnaphthalene
		5220	2,2,4-Trimethylpentane
		4665	2,2-Dichloropropane
		4410	2-Butanone (Methyl ethyl ketone, MEK)
		4500	2-Chloroethyl vinyl ether
		4535	2-Chlorotoluene
		4860	2-Hexanone (MBK)
		5145	2-Methylaniline (o-Toluidine)
		6385	2-Methylnaphthalene
		5020	2-Nitropropane
		4540	4-Chlorotoluene
		4910	4-Isopropyltoluene (p-Cymene)
		4995	4-Methyl-2-pentanone (MIBK)
		4315	Acetone
		4320	Acetonitrile
		4325	Acrolein (Propenal)
		4340	Acrylonitrile
		4355	Allyl chloride (3-Chloropropene)
		4375	Benzene
		4385	Bromobenzene
		4390	Bromochloromethane
		4395	Bromodichloromethane
		4397	Bromoethane (Ethyl Bromide)
		4400	Bromoform
		4450	Carbon disulfide
		4455	Carbon tetrachloride
		4475	Chlorobenzene

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Solids EPA 8260C

4575	Chlorodibromomethane
4485	Chloroethane (Ethyl chloride)
4505	Chloroform
4525	Chloroprene (2-Chloro-1,3-butadiene)
4645	cis-1,2-Dichloroethylene
4680	cis-1,3-Dichloropropene
4600	cis-1,4-Dichloro-2-butene
4555	Cyclohexane
4560	Cyclohexanone
4580	Dibromochloropropane
4595	Dibromomethane (Methylene bromide)
4625	Dichlorodifluoromethane (Freon-12)
4725	Diethyl ether
9375	Di-isopropylether (DIPE)
4750	Ethanol
4755	Ethyl acetate
4810	Ethyl methacrylate
4765	Ethylbenzene
4770	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)
4835	Hexachlorobutadiene
4840	Hexachloroethane
4870	Iodomethane (Methyl iodide)
4875	Isobutyl alcohol (2-Methyl-1-propanol)
4895	Isopropyl alcohol (2-Propanol, Isopropanol)
4900	Isopropylbenzene (Cumene)
4925	Methacrylonitrile
4940	Methyl acetate
4945	Methyl acrylate
4950	Methyl bromide (Bromomethane)
4960	Methyl chloride (Chloromethane)
4990	Methyl methacrylate
5000	Methyl tert-butyl ether (MTBE)
4965	Methylcyclohexane
4975	Methylene chloride (Dichloromethane)
5245	m-Xylene
5005	Naphthalene
4425	n-Butyl alcohol (1-Butanol, n-Butanol)
4435	n-Butylbenzene
5015	Nitrobenzene
5025	n-Nitroso-di-n-butylamine
5090	n-Propylbenzene
5250	o-Xylene

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Solids

EPA 8260C	5035	Pentachloroethane		
	5080	Propionitrile (Ethyl cyanide)		
	5255	p-Xylene		
	6685	Safrole		
	4440	sec-Butylbenzene		
	5100	Styrene		
	4370	T-amylmethylether (TAME)		
	4420	tert-Butyl alcohol		
	4445	tert-Butylbenzene		
	5115	Tetrachloroethylene (Perchloroethylene)		
	5120	Tetrahydrofuran (THF)		
	5140	Toluene		
	4700	trans-1,2-Dichloroethylene		
	4685	trans-1,3-Dichloropropylene		
	4605	trans-1,4-Dichloro-2-butene		
	5170	Trichloroethene (Trichloroethylene)		
	5175	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)		
	5225	Vinyl acetate		
	5235	Vinyl chloride		
	5260	Xylene (total)		
EPA 8270C			10185805	Semivolatile Organic compounds by GC/MS
	6703	1,1'-Biphenyl (BZ-0)		
	6705	1,2,3,4-Tetrachlorobenzene		
	6710	1,2,3,5-Tetrachlorobenzene		
	6715	1,2,4,5-Tetrachlorobenzene		
	5155	1,2,4-Trichlorobenzene		
	4610	1,2-Dichlorobenzene		
	6221	1,2-Diphenylhydrazine		
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)		
	4615	1,3-Dichlorobenzene		
	6160	1,3-Dinitrobenzene (1,3-DNB)		
	4620	1,4-Dichlorobenzene		
	6420	1,4-Naphthoquinone		
	5790	1-Chloronaphthalene		
	6380	1-Methylnaphthalene		
	6425	1-Naphthylamine		
	6735	2,3,4,6-Tetrachlorophenol		
	6835	2,4,5-Trichlorophenol		
	6840	2,4,6-Trichlorophenol		
	6000	2,4-Dichlorophenol		
	6130	2,4-Dimethylphenol		
	6175	2,4-Dinitrophenol		

Solids EPA 8270C

6185	2,4-Dinitrotoluene (2,4-DNT)
6005	2,6-Dichlorophenol
6190	2,6-Dinitrotoluene (2,6-DNT)
5515	2-Acetylaminofluorene
5795	2-Chloronaphthalene
5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2 -methylphenol)
5145	2-Methylaniline (o-Toluidine)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6430	2-Naphthylamine
6460	2-Nitroaniline
6490	2-Nitrophenol
5050	2-Picoline (2-Methylpyridine)
5945	3,3'-Dichlorobenzidine
6120	3,3'-Dimethylbenzidine
6355	3-Methylcholanthrene
6465	3-Nitroaniline
5540	4-Aminobiphenyl
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6105	4-Dimethyl aminoazobenzene
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
6510	4-Nitroquinoline 1-oxide
6570	5-Nitro-o-toluidine
6115	7,12-Dimethylbenz(a) anthracene
9417	7h-Dibenzo(c, g) carbazole
6125	a-a-Dimethylphenethylamine
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
5545	Aniline
5555	Anthracene
5560	Aramite
7065	Atrazine
5565	Benzal chloride
5570	Benzaldehyde
5595	Benzidine
5575	Benzo(a)anthracene

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5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene
5610	Benzoic acid
5625	Benzotrichloride
5630	Benzyl alcohol
5635	Benzyl chloride
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
7180	Caprolactam
5680	Carbazole
7260	Chlorobenzilate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7405	Diallate
9354	Dibenz(a, h) acridine
5900	Dibenz(a, j) acridine
5895	Dibenz(a,h) anthracene
9348	Dibenzo(a, h) pyrene
9351	Dibenzo(a, i) pyrene
5890	Dibenzo(a,e) pyrene
5905	Dibenzofuran
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
6205	Diphenylamine
8625	Disulfoton
6260	Ethyl methanesulfonate
7580	Famphur
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane

Solids

EPA 8270C	6290	Hexachlorophene		
	6295	Hexachloropropene		
	6315	Indeno(1,2,3-cd) pyrene		
	7725	Isodrin		
	6320	Isophorone		
	6325	Isosafrole		
	7740	Kepone		
	6345	Methapyrilene		
	6375	Methyl methanesulfonate		
	7825	Methyl parathion (Parathion, methyl)		
	5005	Naphthalene		
	5875	n-Decane		
	5015	Nitrobenzene		
	6525	n-Nitrosodiethylamine		
	6530	n-Nitrosodimethylamine		
	5025	n-Nitroso-di-n-butylamine		
	6545	n-Nitrosodi-n-propylamine		
	6535	n-Nitrosodiphenylamine		
	6550	n-Nitrosomethylethalamine		
	6555	n-Nitrosomorpholine		
	6560	n-Nitrosopiperidine		
	6565	n-Nitrosopyrrolidine		
	6580	n-Octadecane		
	8290	o,o,o-Triethyl phosphorothioate		
	7955	Parathion, ethyl		
	6590	Pentachlorobenzene		
	5035	Pentachloroethane		
	6600	Pentachloronitrobenzene		
	6605	Pentachlorophenol		
	6610	Phenacetin		
	6615	Phenanthrene		
	6625	Phenol		
	7985	Phorate		
	9663	p-Phenylenediamine		
	6650	Pronamide (Kerb)		
	6665	Pyrene		
	5095	Pyridine		
	6685	Safrole		
	8155	Sulfotepp		
	8235	Thionazin (Zinophos)		
EPA 8270C SIM			10242407	Semivolatile Organic compounds by GC/MS Selective Ion Monitoring
	6380	1-Methylnaphthalene		
	6385	2-Methylnaphthalene		

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EPA 8270C SIM	5500	Acenaphthene	
	5505	Acenaphthylene	
	5555	Anthracene	
	5575	Benzo(a)anthracene	
	5580	Benzo(a)pyrene	
	5590	Benzo(g,h,i)perylene	
	5600	Benzo(k)fluoranthene	
	5585	Benzo[b]fluoranthene	
	5855	Chrysene	
	5895	Dibenz(a,h) anthracene	
	6265	Fluoranthene	
	6270	Fluorene	
	6315	Indeno(1,2,3-cd) pyrene	
	5005	Naphthalene	
	6615	Phenanthrene	
	6665	Pyrene	
EPA 8270D			10186002 Semivolatile Organic compounds by GC/MS
	6703	1,1'-Biphenyl (BZ-0)	
	6705	1,2,3,4-Tetrachlorobenzene	
	6710	1,2,3,5-Tetrachlorobenzene	
	6715	1,2,4,5-Tetrachlorobenzene	
	5155	1,2,4-Trichlorobenzene	
	4610	1,2-Dichlorobenzene	
	6221	1,2-Diphenylhydrazine	
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)	
	4615	1,3-Dichlorobenzene	
	6160	1,3-Dinitrobenzene (1,3-DNB)	
	4620	1,4-Dichlorobenzene	
	6420	1,4-Naphthoquinone	
	5790	1-Chloronaphthalene	
	6380	1-Methylnaphthalene	
	6425	1-Naphthylamine	
	6735	2,3,4,6-Tetrachlorophenol	
	6835	2,4,5-Trichlorophenol	
	6840	2,4,6-Trichlorophenol	
	6000	2,4-Dichlorophenol	
	6130	2,4-Dimethylphenol	
	6175	2,4-Dinitrophenol	
	6185	2,4-Dinitrotoluene (2,4-DNT)	
	6005	2,6-Dichlorophenol	
	6190	2,6-Dinitrotoluene (2,6-DNT)	
	5515	2-Acetylaminofluorene	
	5795	2-Chloronaphthalene	

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Solids EPA 8270D

5800	2-Chlorophenol
6360	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2 -methylphenol)
5145	2-Methylaniline (o-Toluidine)
6385	2-Methylnaphthalene
6400	2-Methylphenol (o-Cresol)
6430	2-Naphthylamine
6460	2-Nitroaniline
6490	2-Nitrophenol
5050	2-Picoline (2-Methylpyridine)
5945	3,3'-Dichlorobenzidine
6120	3,3'-Dimethylbenzidine
6355	3-Methylcholanthrene
6465	3-Nitroaniline
5540	4-Aminobiphenyl
5660	4-Bromophenyl phenyl ether (BDE-3)
5700	4-Chloro-3-methylphenol
5745	4-Chloroaniline
5825	4-Chlorophenyl phenylether
6105	4-Dimethyl aminoazobenzene
6410	4-Methylphenol (p-Cresol)
6470	4-Nitroaniline
6500	4-Nitrophenol
6510	4-Nitroquinoline 1-oxide
6570	5-Nitro-o-toluidine
6115	7,12-Dimethylbenz(a) anthracene
9417	7h-Dibenzo(c, g) carbazole
6125	a-a-Dimethylphenethylamine
5500	Acenaphthene
5505	Acenaphthylene
5510	Acetophenone
5545	Aniline
5555	Anthracene
5560	Aramite
7065	Atrazine
5565	Benzal chloride
5570	Benzaldehyde
5595	Benzidine
5575	Benzo(a)anthracene
5580	Benzo(a)pyrene
5590	Benzo(g,h,i)perylene
9309	Benzo(j)fluoranthene
5600	Benzo(k)fluoranthene
5585	Benzo[b]fluoranthene

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Solids EPA 8270D

5610	Benzoic acid
5625	Benzotrichloride
5630	Benzyl alcohol
5635	Benzyl chloride
5760	bis(2-Chloroethoxy)methane
5765	bis(2-Chloroethyl) ether
5780	bis(2-Chloroisopropyl) ether
5670	Butyl benzyl phthalate
7180	Caprolactam
5680	Carbazole
7260	Chlorobenzilate
5855	Chrysene
6065	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)
7405	Diallate
9354	Dibenz(a, h) acridine
5900	Dibenz(a, j) acridine
5895	Dibenz(a,h) anthracene
9348	Dibenzo(a, h) pyrene
9351	Dibenzo(a, i) pyrene
5890	Dibenzo(a,e) pyrene
5905	Dibenzofuran
6070	Diethyl phthalate
7475	Dimethoate
6135	Dimethyl phthalate
5925	Di-n-butyl phthalate
6200	Di-n-octyl phthalate
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)
6205	Diphenylamine
8625	Disulfoton
6260	Ethyl methanesulfonate
7580	Famphur
6265	Fluoranthene
6270	Fluorene
6275	Hexachlorobenzene
4835	Hexachlorobutadiene
6285	Hexachlorocyclopentadiene
4840	Hexachloroethane
6290	Hexachlorophene
6295	Hexachloropropene
6315	Indeno(1,2,3-cd) pyrene
7725	Isodrin
6320	Isophorone

Solids

EPA 8270D	6325	Isosafrole		
	7740	Kepone		
	6345	Methapyrilene		
	6375	Methyl methanesulfonate		
	7825	Methyl parathion (Parathion, methyl)		
	5005	Naphthalene		
	5875	n-Decane		
	5015	Nitrobenzene		
	6525	n-Nitrosodiethylamine		
	6530	n-Nitrosodimethylamine		
	5025	n-Nitroso-di-n-butylamine		
	6545	n-Nitrosodi-n-propylamine		
	6535	n-Nitrosodiphenylamine		
	6550	n-Nitrosomethylethalamine		
	6555	n-Nitrosomorpholine		
	6560	n-Nitrosopiperidine		
	6565	n-Nitrosopyrrolidine		
	6580	n-Octadecane		
	8290	o,o,o-Triethyl phosphorothioate		
	7955	Parathion, ethyl		
	6590	Pentachlorobenzene		
	5035	Pentachloroethane		
	6600	Pentachloronitrobenzene		
	6605	Pentachlorophenol		
	6610	Phenacetin		
	6615	Phenanthrene		
	6625	Phenol		
	7985	Phorate		
	9663	p-Phenylenediamine		
	6650	Pronamide (Kerb)		
	6665	Pyrene		
	5095	Pyridine		
	6685	Safrole		
	8155	Sulfotepp		
	8235	Thionazin (Zinophos)		
EPA 8270D SIM			10242509	Semivolatile Organic compounds by GC/MS Selective Ion Monitoring
	6380	1-Methylnaphthalene		
	6385	2-Methylnaphthalene		
	5500	Acenaphthene		
	5505	Acenaphthylene		
	5555	Anthracene		
	5575	Benzo(a)anthracene		
	5580	Benzo(a)pyrene		

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Solids

EPA 8270D SIM	5590	Benzo(g,h,i)perylene		
	5600	Benzo(k)fluoranthene		
	5585	Benzo[b]fluoranthene		
	5855	Chrysene		
	5895	Dibenz(a,h) anthracene		
	6265	Fluoranthene		
	6270	Fluorene		
	6315	Indeno(1,2,3-cd) pyrene		
	5005	Naphthalene		
	6615	Phenanthrene		
	6665	Pyrene		
EPA 8310			10187607	Polynuclear Aromatic Hydrocarbons by HPLC/UV-VIS
	5500	Acenaphthene		
	5505	Acenaphthylene		
	5555	Anthracene		
	5575	Benzo(a)anthracene		
	5580	Benzo(a)pyrene		
	5590	Benzo(g,h,i)perylene		
	5600	Benzo(k)fluoranthene		
	5585	Benzo[b]fluoranthene		
	5855	Chrysene		
	5895	Dibenz(a,h) anthracene		
	6265	Fluoranthene		
	6270	Fluorene		
	6315	Indeno(1,2,3-cd) pyrene		
	5005	Naphthalene		
	6615	Phenanthrene		
	6665	Pyrene		
EPA 8330			10189807	Nitroaromatics and Nitramines by HPLC/UV-VIS
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)		
	6160	1,3-Dinitrobenzene (1,3-DNB)		
	9651	2,4,6-Trinitrotoluene (2,4,6-TNT)		
	6185	2,4-Dinitrotoluene (2,4-DNT)		
	6190	2,6-Dinitrotoluene (2,6-DNT)		
	9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)		
	6462	2-Nitroguanidine		
	9507	2-Nitrotoluene		
	9510	3-Nitrotoluene		
	9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)		
	9513	4-Nitrotoluene		
	6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)		

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Solids

EPA 8330	5015	Nitrobenzene		
	6485	Nitroglycerin		
	9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)		
	9558	Pentaerythritoltetranitrate (PETN)		
	9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)		
EPA 8330A			10190008	Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)
	6885	1,3,5-Trinitrobenzene (1,3,5-TNB)		
	6160	1,3-Dinitrobenzene (1,3-DNB)		
	9651	2,4,6-Trinitrotoluene (2,4,6-TNT)		
	6185	2,4-Dinitrotoluene (2,4-DNT)		
	6190	2,6-Dinitrotoluene (2,6-DNT)		
	9303	2-Amino-4,6-dinitrotoluene (2-am-dnt)		
	9507	2-Nitrotoluene		
	9510	3-Nitrotoluene		
	9306	4-Amino-2,6-dinitrotoluene (4-am-dnt)		
	9513	4-Nitrotoluene		
	6415	Methyl-2,4,6-trinitrophenylnitramine (tetryl)		
	5015	Nitrobenzene		
	6485	Nitroglycerin		
	9522	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)		
	9558	Pentaerythritoltetranitrate (PETN)		
	9432	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)		
EPA 9010B			10193007	Total and Amenable Cyanide by Distillation and UV-Vis
	1510	Amenable cyanide		
	1645	Total cyanide		
EPA 9010C			10243002	Total and Amenable Cyanide by Distillation and UV-Vis
	1510	Amenable cyanide		
	1645	Total cyanide		
EPA 9012A			10193405	Total and Amenable Cyanide (automated colorimetric with off-line distillation)
	1645	Total cyanide		
EPA 9012B			10243206	Total and Amenable Cyanide (automated colorimetric with off-line distillation)
	1645	Total cyanide		
EPA 9013			10193609	Cyanide Extraction Procedure for Solids and Oils
	9822	Extraction/Preparation		

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Solids

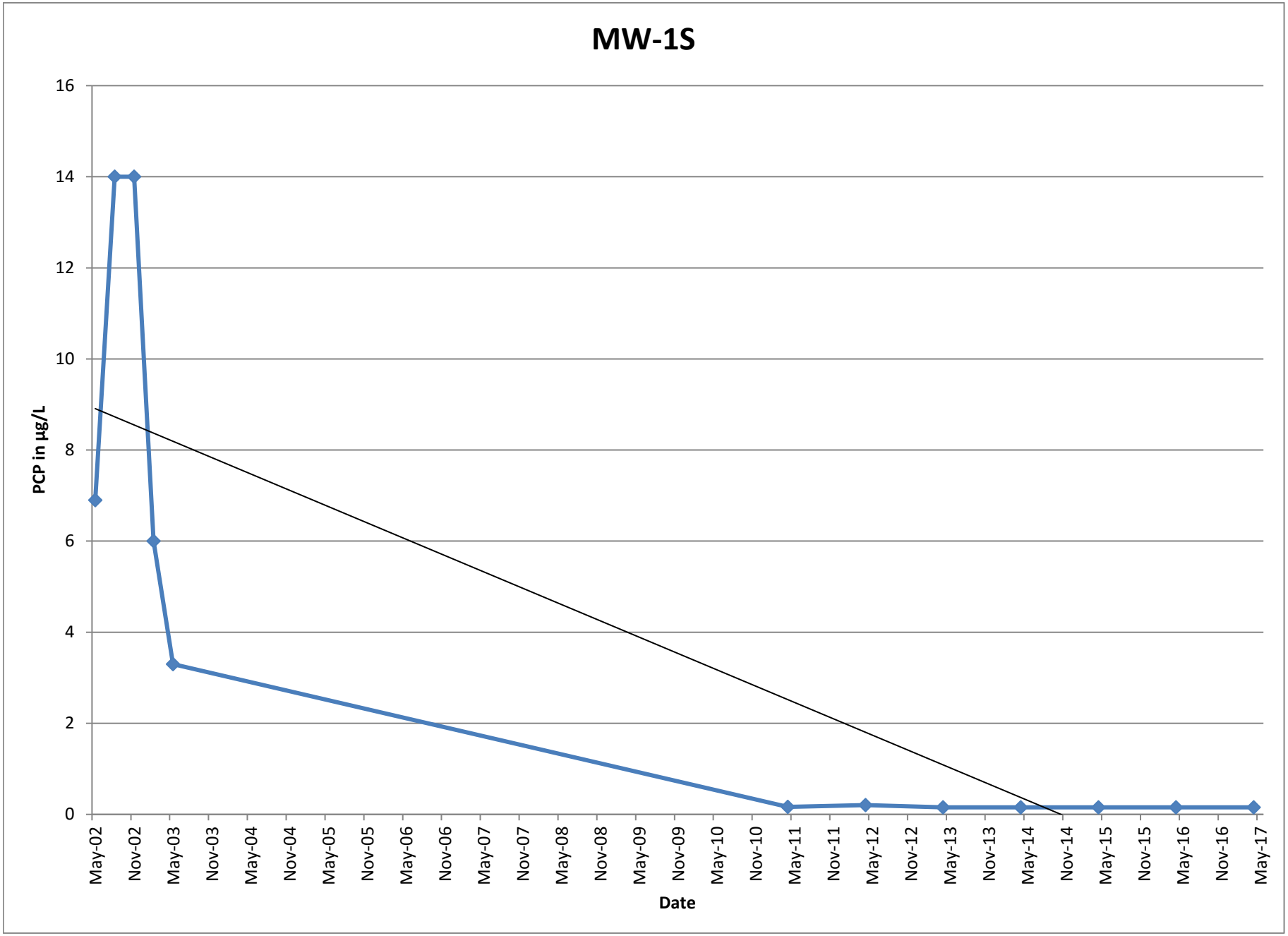
EPA 9013A			10308802	Cyanide Extraction Procedure for Solids and Oils
	9822	Extraction/Preparation		
EPA 9023			10195003	Extractable Organic Halides (EOX) in Solids
	1720	Extractable organics halides (EOX)		
EPA 9030B			10195605	Acid-Soluble and Acid-Insoluble sulfides: Distillation
	2005	Sulfide		
EPA 9034			10196006	Titrimetric Procedure for Acid-Soluble and Acid-Insoluble Sulfides
	2005	Sulfide		
EPA 9045C			10198400	Soil and Waste pH
	1900	pH		
EPA 9045D			10244607	Soil and Waste pH
	1900	pH		
EPA 9050A			10198808	Specific Conductance
	1610	Conductivity		
EPA 9056			10199403	Determination of Inorganic Anions by Ion Chromatography
	1540	Bromide		
	1575	Chloride		
	1730	Fluoride		
	1810	Nitrate as N		
	1840	Nitrite as N		
	1870	Orthophosphate as P		
	2000	Sulfate		
EPA 9056A			10199607	Determination of Inorganic Anions by Ion Chromatography
	1540	Bromide		
	1575	Chloride		
	1730	Fluoride		
	1805	Nitrate		
	1835	Nitrite		
	1870	Orthophosphate as P		
	2000	Sulfate		
EPA 9060			10200201	Total Organic Carbon
	2040	Total organic carbon		
EPA 9060A			10244801	Total Organic Carbon
	2040	Total organic carbon		
EPA 9071B			10201602	Oil and Grease Extraction Method for sludge and sediment samples
	1860	Oil & Grease		

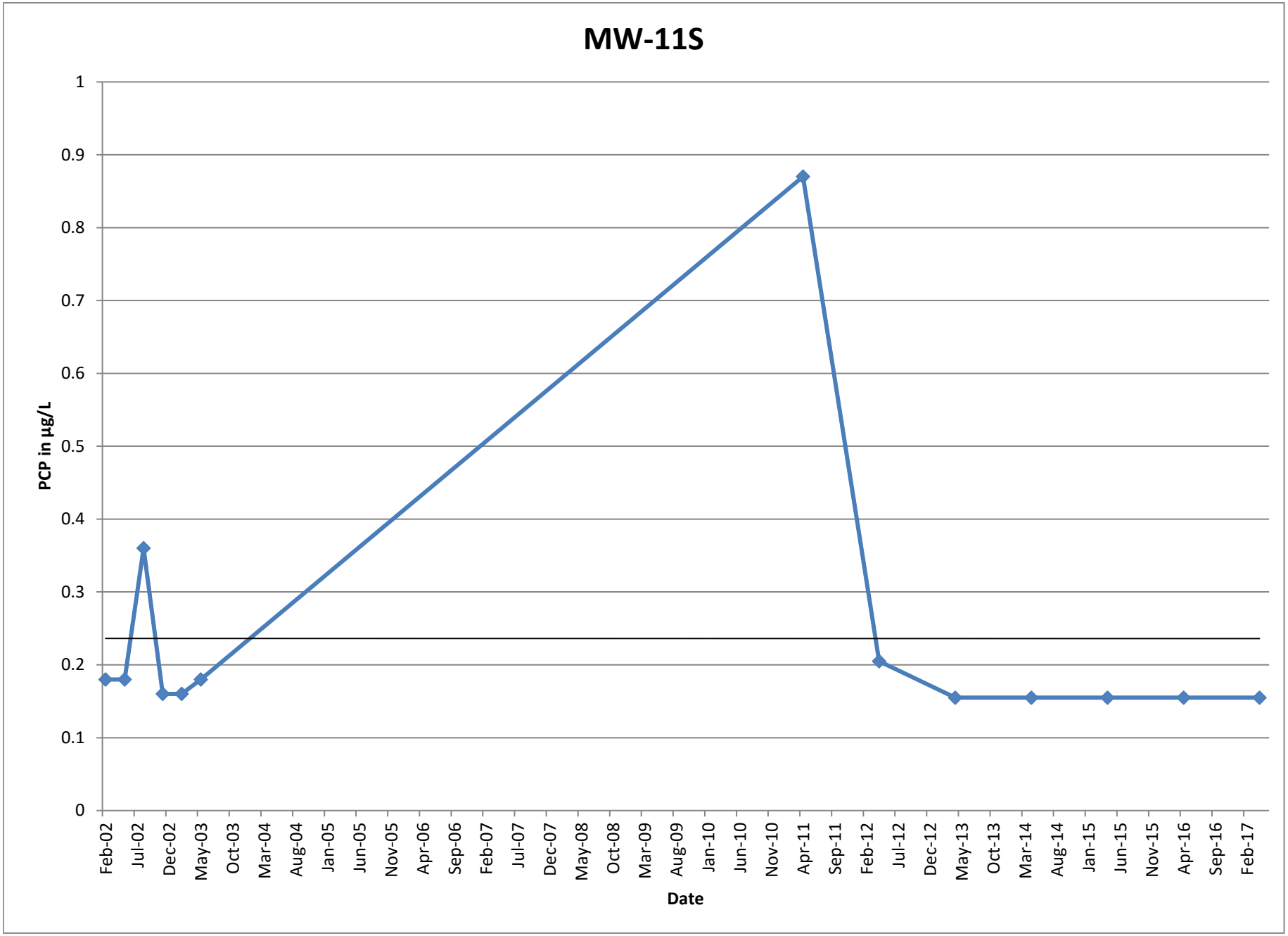
Solids

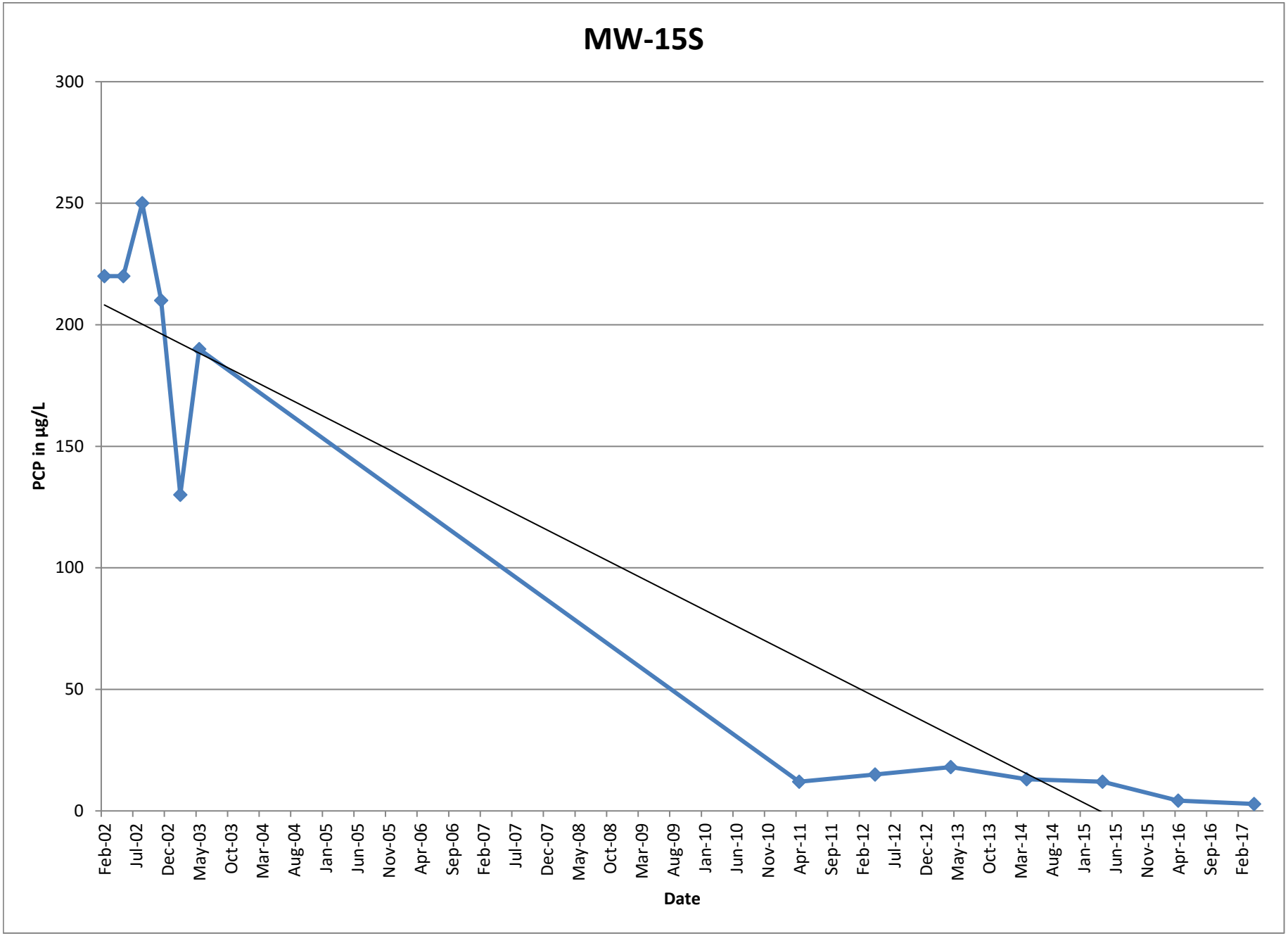
EPA 9095			10204009	Paint Filter Liquids Test
	9822	Extraction/Preparation		
EPA 9095A			10204203	Paint Filter Liquids Test
	9822	Extraction/Preparation		
NWTPH-Dx			90018409	Oregon DEQ TPH Diesel Range
	9369	Diesel range organics (DRO)		
NWTPH-Gx			90018603	Oregon DEQ TPH Gasoline Range Organics by GC/FID-PID Purge & Trap
	9408	Gasoline range organics (GRO)		
NWTPH-HCID			90013200	Oregon DEQ Total Petroleum Hydrocarbon ID
	2050	Total Petroleum Hydrocarbons (TPH)		
OA-1			90013802	Iowa TPH Gx by GC/PID Purge & Trap
	9408	Gasoline range organics (GRO)		
OA-2			90014009	Iowa TPH Dx
	9369	Diesel range organics (DRO)		
SM 2540 G 20th ED			20005258	Total, Fixed, and Volatile Solids in Solid and Semisolid Samples
	1725	Total, fixed, and volatile residue		
Walkley-Black 1969			60012002	Total Organic Carbon in Soils and Sediments by Titration
	2040	Total organic carbon		

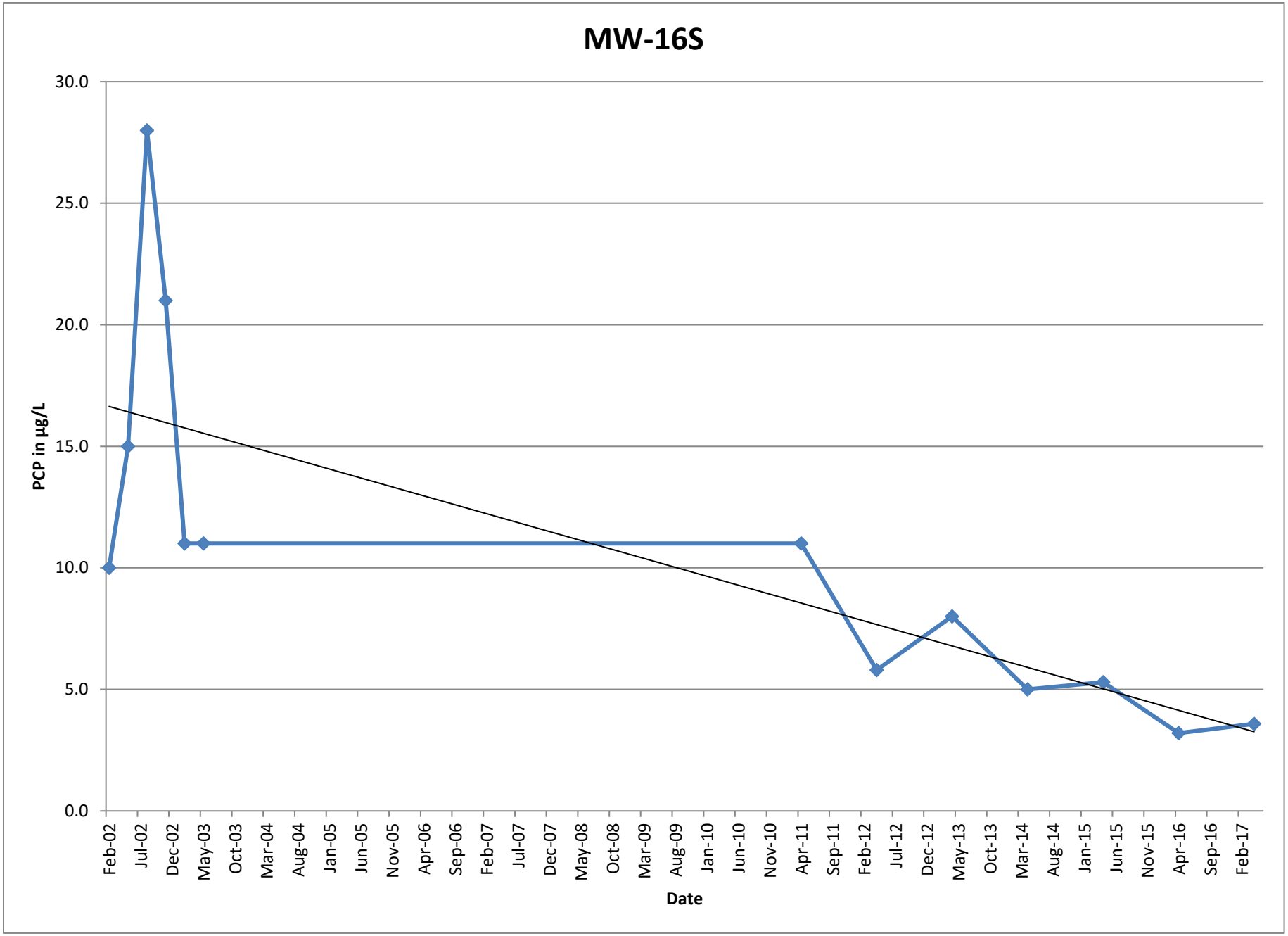
Appendix D

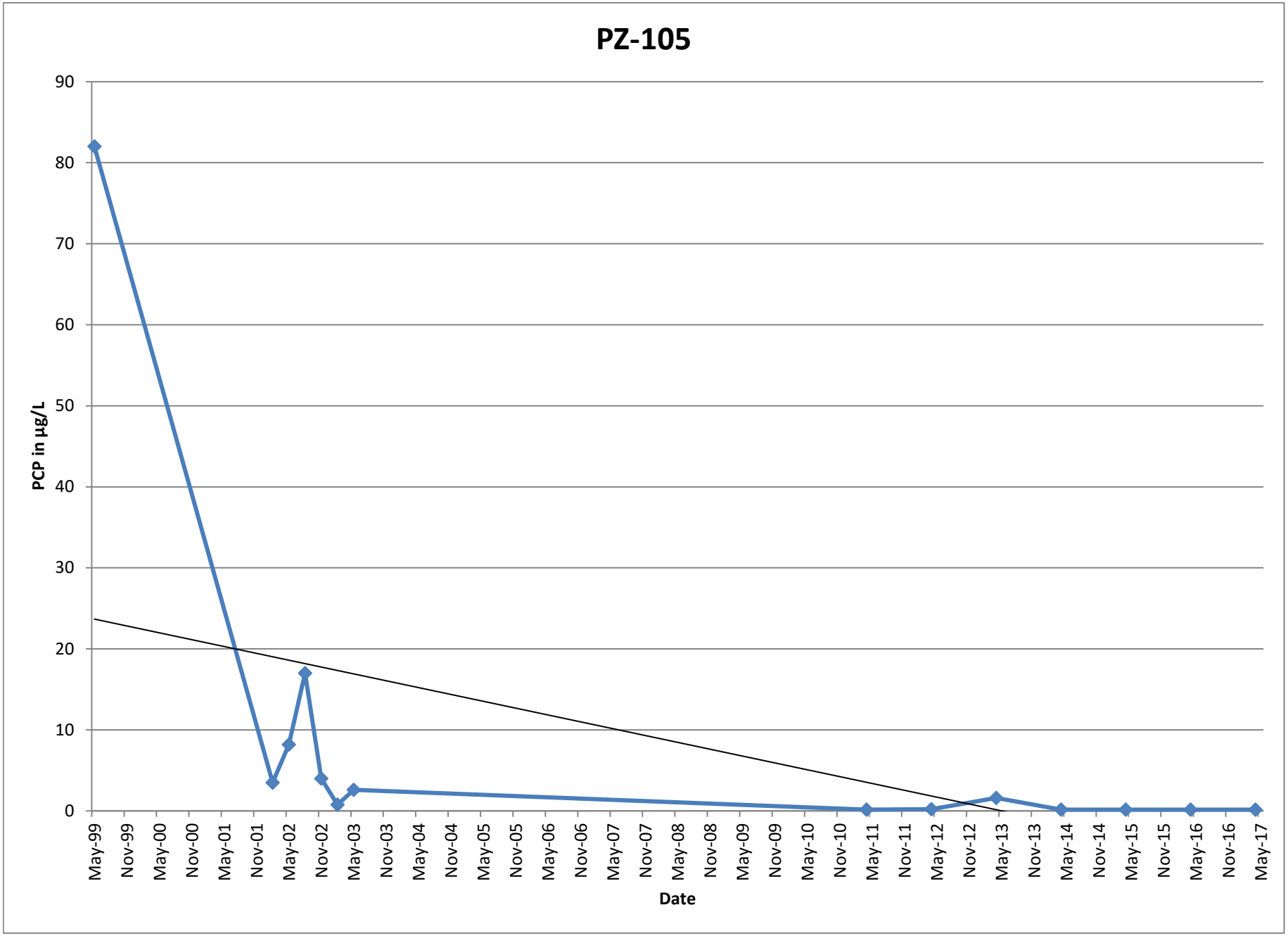
Trend Plots for Select Wells


MW-1S
PCP in µg/L
16
14
12
10
8
6
4
2
0
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
Nov-16
May-17
Date


MW-11S
PCP in µg/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Feb-02
Jul-02
Dec-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10
Nov-10
Apr-11
Sep-11
Feb-12
Jul-12
Dec-12
May-13
Oct-13
Mar-14
Aug-14
Jan-15
Jun-15
Nov-15
Apr-16
Sep-16
Feb-17
Date


MW-15S
PCP in µg/L
300
250
200
150
100
50
0
Feb-02
Jul-02
Dec-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10
Nov-10
Apr-11
Sep-11
Feb-12
Jul-12
Dec-12
May-13
Oct-13
Mar-14
Aug-14
Jan-15
Jun-15
Nov-15
Apr-16
Sep-16
Feb-17
Date


MW-16S
PCP in µg/L
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Feb-02
Jul-02
Dec-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10
Nov-10
Apr-11
Sep-11
Feb-12
Jul-12
Dec-12
May-13
Oct-13
Mar-14
Aug-14
Jan-15
Jun-15
Nov-15
Apr-16
Sep-16
Feb-17
Date


PZ-105
PCP in µg/L
90
80
70
60
50
40
30
20
10
0
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
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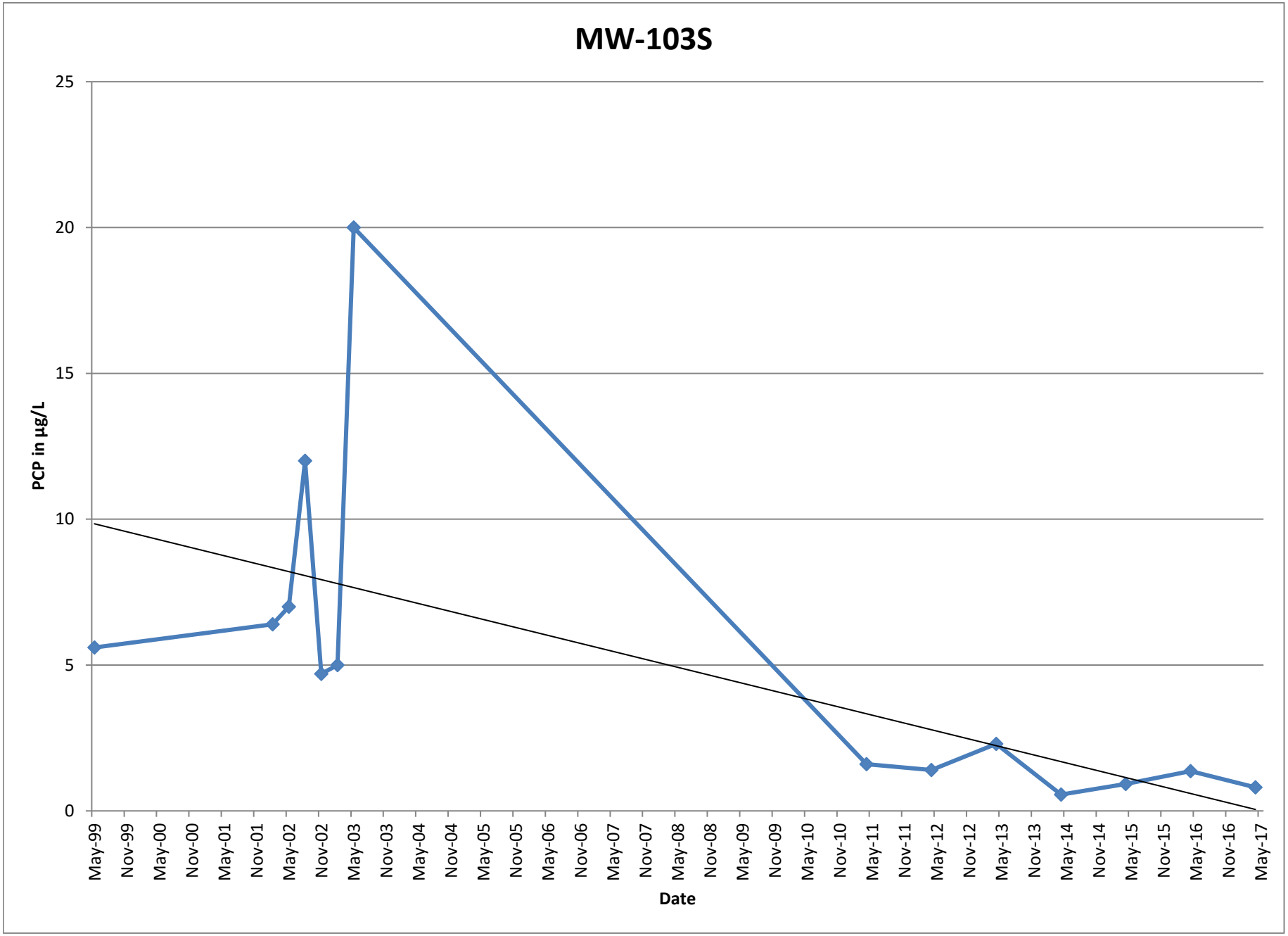
Nov-15
May-16
Nov-16
May-17
Date


MW-103S
PCP in µg/L
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20
15
10
5
0
May-99
Nov-99
May-00
Nov-00
May-01
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Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Nov-07
May-08
Nov-08
May-09
Nov-09
May-10
Nov-10
May-11
Nov-11
May-12
Nov-12
May-13
Nov-13
May-14
Nov-14
May-15
Nov-15
May-16
Nov-16
May-17
Date